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REPORT TO THE CONGRESS

Management Of Federally
Financed Research ^{LLY}
By The University Of Michigan
-- A Case Study B-117219

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BY THE COMPTROLLER GENERAL
OF THE UNITED STATES

SEPT 25, 1970

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D C 20548

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To the President of the Senate and the
Speaker of the House of Representatives

This is our report on the management of federally financed research by the University of Michigan—a case study. The university carries on research for all the major Federal research agencies. Our study was made pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), and the Accounting and Auditing Act of 1950 (31 U.S.C. 67).

Copies of this report are being sent to the Director, Office of Management and Budget, and to the top officials of the major Federal research agencies.

A handwritten signature in cursive script, reading "James B. Arents".

Comptroller General
of the United States

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ABBREVIATIONS

AEC	Atomic Energy Commission
BOB (note a)	Bureau of the Budget
DCAA	Defense Contract Audit Agency
DOD	Department of Defense
GAO	General Accounting Office
HEW	Department of Health, Education, and Welfare
NASA	National Aeronautics and Space Administration
NIH	National Institutes of Health
NSF	National Science Foundation
PHS	Public Health Service
WRL	Willow Run Laboratories

^aPursuant to Reorganization Plan No. 2 of 1970 the functions of the Bureau of the Budget which pertain to matters discussed in this report were transferred to the newly established Office of Management and Budget effective July 1, 1970.

D I G E S T

WHY THE STUDY WAS MADE

By any accepted standard of measurement, Government-funded research by educational institutions has become big business. In fiscal year 1969 it reached \$1.7 billion--about 10 percent of the total Federal research outlay--from a relatively modest \$370 million a decade earlier. Although the \$1.7 billion is dispersed among many institutions, relatively substantial amounts are placed with a few large institutions.

The General Accounting Office (GAO) decided that a study of how one of the larger institutions manages research supported by the Government and how it views some of the issues that have evolved from the great increase in that research would provide useful information for members and committees of the Congress and others concerned with research and would be a worthwhile addition to the existing body of knowledge about research.

The topics covered in this study, in terms of their substantive nature, are believed to be common to most, if not all, educational institutions in the management of their research programs. However, procedures and methods probably differ among individual institutions.

GAO reviewed:

- The organizational structure, particularly how it blends the traditional autonomy of the individual departments with a central liaison and servicing function, and how it integrates research with instructional goals. (See p. 11.)
- The process of creating research ideas, finding sponsors, and formalizing proposals to Federal agencies and the ratio between proposals accepted and rejected by the agencies. (See p. 55.)
- The methods of funding. (See p. 81.)
- How research costs--direct and indirect--are accounted for. (See p. 89.)
- How the Federal agencies monitor projects that they are sponsoring. (See p. 104.)
- How equipment is procured. (See p. 44.)

--The extent of auditing that is done to test the validity of expenditures and the effectiveness of control procedures. (See p. 108)

Officials of the university cooperated with GAO in its study and have reviewed this report. Their views have been included.

FINDINGS AND CONCLUSIONS

During fiscal 1968 the university received 625 grants totaling \$28 million and 315 contracts totaling \$30 million.

During that year the university spent more than \$48 million on federally financed research projects, about 77 percent of the university's total research effort and 21 percent of its total operating funds from all sources. For all colleges and universities in the United States, these percentages were 85 and 14 percent, respectively.

Government-funded research at the university includes practically all areas of humanistic and scientific exploration--life sciences, engineering, physical sciences, and social sciences.

The university's resources devoted to research during 1968 reflect the magnitude of its research effort.

- The usable space in the university's physical structures devoted to research nearly equaled that used for instruction.
- A large part of \$90.5 million worth of university-owned equipment and \$22.5 million worth of Government-owned equipment was used for research.
- Of 21,400 people, 8,000 worked full- or part-time directly on research--800 teaching faculty, 1,300 research personnel, 2,400 non-academic personnel, and 3,500 graduate and undergraduate students.

Research activities involve, in varying degree, all 95 departments of the university's 18 schools and colleges, as well as several independent units created primarily for research activities.

The study indicated that, in general, the university's management of federally financed research was in harmony with the management needs of the university and the requirements prescribed by the Federal agencies. Exceptions were found in only a few areas, some of them not entirely within the control of the university.

With respect to the methods of funding, the time lag between the payment of project costs and the reimbursement by the Federal agencies,

principally under cost-reimbursement contracts, requires the university to use about \$3 6 million of its own funds monthly. (See p. 86)

The university maintains that, since it is allowed neither a fee nor interest on such funds, the agencies should advance sufficient funds to cover all recoverable project costs.

The National Association of College and University Business Officers contends that income sacrificed by the expenditure of funds that might otherwise be invested is a real cost to the universities. It has recommended to the Office of Management and Budget that interest on such funds be considered an allowable cost. As GAO sees it in the case of the University of Michigan, the use of its own funds amounts to additional cost sharing by the university. The Office of Management and Budget is considering revision of the interest provision to allow interest expense actually incurred in certain special circumstances.

Several issues that have arisen from the dramatic upsurge in federally funded research by educational institutions have engaged the concern of certain elements of the Congress and others closely associated with such research.

One of those issues is whether the acknowledged benefits of heavy research involvement are offset by certain adverse effects on the universities' educational function and, if so, to what extent. (See p. 25.) Another issue is whether educational institutions should be required to share in the cost of Government-funded research. (See p. 68)

Both of those issues are of long standing. The difficulties of resolving them are compounded by the fact that research by educational institutions is a handmaiden of the educational function, particularly at the graduate level; that it is considered necessary to enable Federal agencies to achieve their mission; and that both research and the expansion of opportunities for higher education are national goals of high priority. This report synthesizes the considerations advanced on both sides of those issues. (See pp. 25 and 68.)

GAO has summarized the history of grants versus contracts as instruments for funding research projects and the problems that have frustrated efforts to determine the conditions under which one or the other, or some alternative instrument, should be used. (See p. 63.) The significance of that matter stems from its tie-in with cost sharing. Legislation has required cost sharing under grants but not under contracts.

RECOMMENDATIONS OR SUGGESTIONS

GAO believes that the Government's cost principles as they relate to interest cost should not be repealed or substantially altered. GAO is recommending that the Director, Office of Management and Budget, in collaboration with other concerned Federal agencies, study the feasibility of

adopting a uniform system of providing universities with sufficient advanced funds for programs financed by all agencies. (See p. 88.)

The use of provisional and multiple rates, rather than predetermined and single rates, for allocating indirect costs to research projects has been of concern to university officials. GAO believes that there is merit in a suggested method of using predetermined fixed rates, with a provision for "rolling forward" to the next period the difference--plus or minus--between the estimated costs and actual costs. GAO is recommending that the Director, Office of Management and Budget, consider the roll-forward concept and pursue this matter further with the various Federal agencies and educational institutions. (See p. 99.)

The use of ^{several} multiple rates, instead of a single rate, appears to be justified on the ground that the ^{several} multiple-rate method results in more equitable distribution of indirect costs to the individual Federal agencies. The total indirect costs distributed to all Federal agencies would be the same under either method.

AGENCY ACTIONS AND UNRESOLVED ISSUES

The major Federal agencies that financed research at the university (see p. 8) generally endorsed the content of this report as usefully informative on basic aspects of research management at educational institutions. For the most part they concurred in the report's recommendations. The reactions of those agencies on specific topics are synopsized in the report.

MATTERS FOR CONSIDERATION BY THE CONGRESS

The issues of cost sharing and grants versus contracts have been complicated by the appropriation acts for fiscal year 1970 covering the major Federal research agencies. Those acts variously (1) make no provision for cost sharing, (2) require cost sharing on grants only, or (3) require cost sharing on both grants and contracts except for research specifically solicited by the Government. Thus the extent of cost sharing might vary according to which Federal agency is financing the research. GAO is recommending that the Congress consider legislation to prescribe a consistent Government policy for cost sharing in federally financed research for all Federal agencies. (See p. 80)

CHAPTER 1

INTRODUCTION

In recent years the Congress has shown a continuing interest in federally financed research at educational institutions. Because of this interest, the General Accounting Office has made a study at the University of Michigan to ascertain how a large university manages research activities sponsored by the ^{several} ~~various~~ Federal agencies. The University of Michigan, one of the largest recipients of Federal research grants and contracts among higher educational institutions, was selected for this review as it was thought that the nature and dimensions of its management functions would be typical of other large educational institutions that perform federally financed research.

To our knowledge, information on university management of federally financed research has not been furnished previously to the Congress in terms of a specific educational institution from an independent source. Our belief that this information would be of interest to the Congress was a major consideration in making this review.

Our review was directed primarily toward the management functions involved in controlling and coordinating the diverse research activities of the university. We did not evaluate the methodology and results of the research or the validity of the recorded research costs. Further, we did not review Federal fellowships or training grants, and we limited our review of Federal construction grants to determining the extent to which Federal funds were involved in constructing buildings used for research. The scope of our review is described in more detail on page 114.

The photographs in this report were made available to us by officials of the University of Michigan.

In its broadest terms research is generally divided into three main categories--basic research, applied research, and development. Basic research is concerned primarily with gaining a fuller knowledge or understanding of the subject under study. Applied research is directed toward finding

a practical use of knowledge already gained in order to meet a recognized need. Development is the systematic use of knowledge gained from research and is directed toward the production of useful materials, devices, systems, and methods.

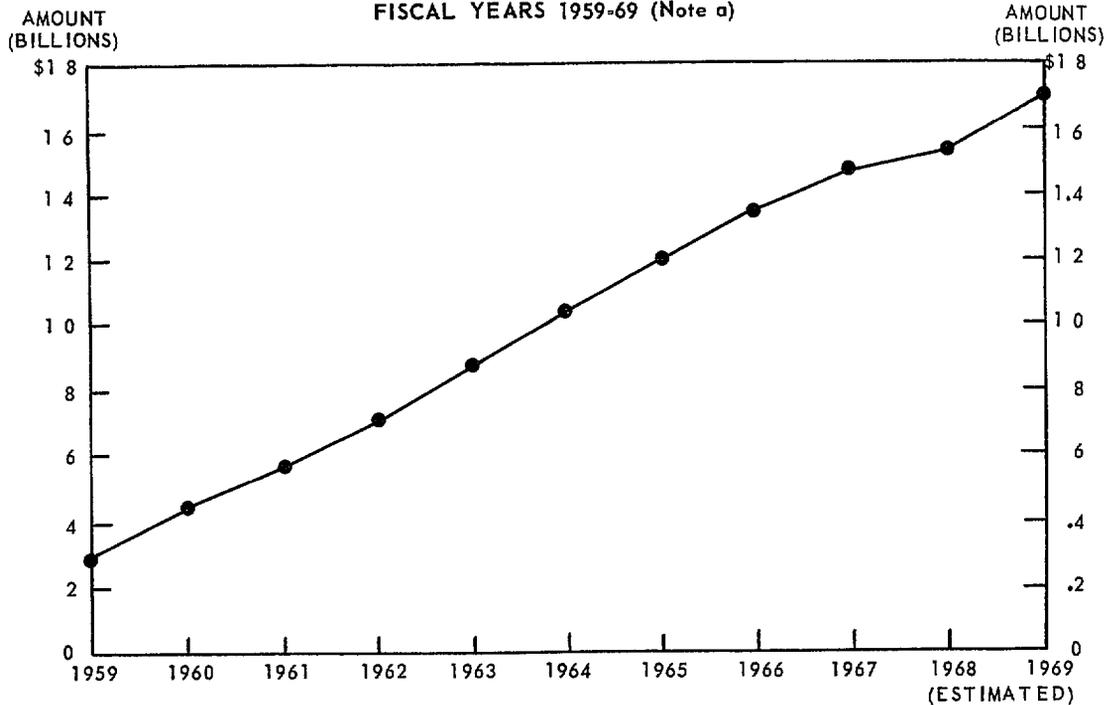
Most basic research financed from Federal sources is done by educational institutions. Federally financed applied research is done principally by the Federal Government itself through in-house laboratories and other research facilities. Industrial firms, although they receive a major portion of the total research dollars, are primarily concerned with the development aspects. The following table summarizes the estimated \$16.2 billion of Federal obligations in fiscal year 1968 for research and development by performer and type of research.

Estimated Federal Obligations for Research and Development
by Performer and Type of Research--Fiscal Year 1968

<u>Performer</u>	<u>Basic research</u>		<u>Applied research</u>		<u>Development</u>	
	<u>(Millions)</u>	<u>Percent</u>	<u>(Millions)</u>	<u>Percent</u>	<u>(Millions)</u>	<u>Percent</u>
Federal Government	\$ 508	24.3	\$1,215	36.7	\$1,822	16.8
Industrial firms	373	17.8	977	29.5	7,950	73.4
Federally funded research and development centers administered by						
Industrial firms	31	1.5	37	1.1	334	3.1
Universities and colleges	262	12.5	185	5.6	264	2.4
Other nonprofit institutions	9	.4	31	.9	191	1.8
Universities and colleges	782	37.4	615	18.6	111	1.0
Other nonprofit institutions	98	4.7	170	5.1	133	1.2
Other	<u>30</u>	1.4	<u>84</u>	2.5	<u>20</u>	.2
Total	<u>\$2,093</u>		<u>\$3,314</u>		<u>\$10,825</u>	

The amount of Federal funds obligated for research and development has been progressively increasing for many years. During fiscal years 1959-69, the percentage of such funds applicable to educational institutions increased--from about 5 percent in 1959 to an estimated 10 percent in 1969. As shown in the following chart, the amount applicable to educational institutions increased from about \$370 million in fiscal year 1959 to an estimated \$1.7 billion in fiscal year 1969.

FEDERAL FUNDS OBLIGATED FOR RESEARCH
AT EDUCATIONAL INSTITUTIONS
FISCAL YEARS 1959-69 (Note a)

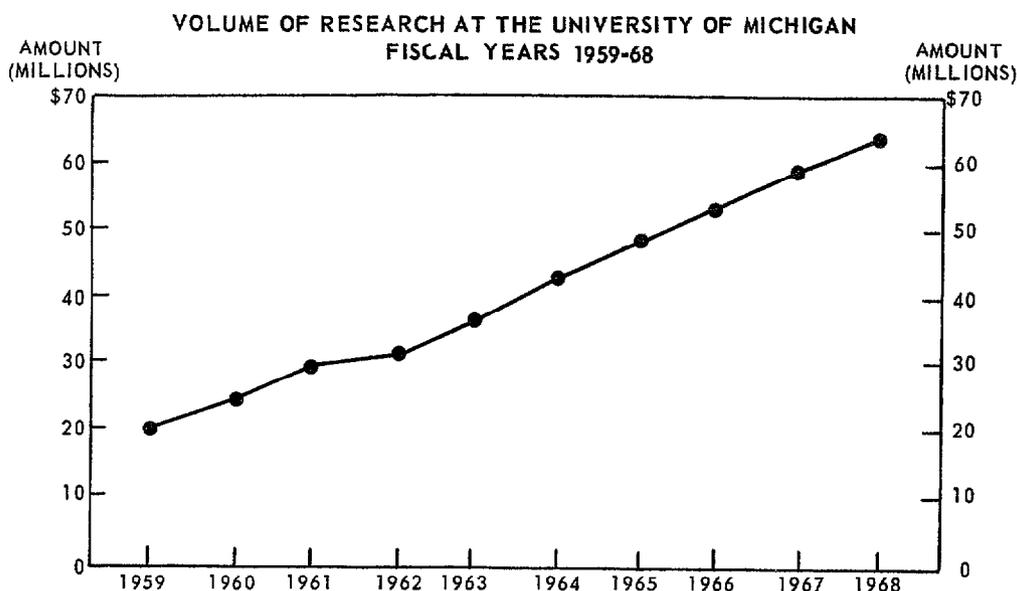


^a EXCLUDING FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS

SOURCE *National Science Foundation reports entitled "Federal Funds for Research, Development, and Other Scientific Activities," volume XVII*

The University of Michigan is a State-supported educational institution. Its Main Campus and most of its research facilities are located in Ann Arbor, Michigan. During 1968 the university had a total faculty and supporting staff of about 21,000. Student enrollment at the Ann Arbor campus during the fall term of 1968 was about 31,000, including about 20,000 undergraduate and 11,000 graduate students. In 1968 the university awarded about 4,600 graduate and 4,300 undergraduate degrees.

The university carries out a substantial volume of research which is financed by both the university and various outside, including Federal, sources. As shown in the chart below, the volume of research at the university during the 10 fiscal years 1959-68 increased steadily--from about \$20 million in fiscal year 1959 to about \$62 million in fiscal year 1968.



Federal agencies--primarily the Departments of Defense and Health, Education, and Welfare--provide most of the funds expended by the university for research. For several years, the university has been among the top 10 educational institutions in dollar amount of federally financed research. The sources of the funds expended for research during fiscal years 1965-68 are summarized below.

University of Michigan Expenditures for Research
by Source of Funds--Fiscal Years 1965-68

<u>Source</u>	<u>Amount</u>			
	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
	----- (millions) -----			
Department of Defense (DOD)	\$16 7	\$16 4	\$18 0	\$16 1
Department of Health, Education, and Welfare (HEW)	12.0	13.3	15 7	18 3
National Aeronautics and Space Administration (NASA)	4.2	5.0	5.3	4.4
National Science Foundation (NSF)	2.6	3.1	3.6	4 6
Atomic Energy Commission (AEC)	2.3	2.5	2 6	2 5
Other Federal agencies	<u>.6</u>	<u>1 1</u>	<u>1.1</u>	<u>2.0</u>
Total--Federal sources	<u>38 4</u>	<u>41 4</u>	<u>46 3</u>	<u>48.1</u>
University funds	3.6	4.1	5 6	4.7
Industry	2 2	1.9	3 2	3.2
Private foundations	2.2	2 2	2 6	3 8
State and local government	.3	1.1	.5	.5
Other (includes gifts and endowments)	<u>1 1</u>	<u>1 3</u>	<u>1 4</u>	<u>1 8</u>
Total--non-Federal sources	<u>9 4</u>	<u>10.6</u>	<u>13 3</u>	<u>14 0</u>
Total	<u>\$47 8</u>	<u>\$52.0</u>	<u>\$59.6</u>	<u>\$62 1</u>

The \$48.1 million shown above for federally financed research represents about 77 percent of the university's total expenditures for research in fiscal year 1968 and about 21 percent of the university's total operating funds of \$224.4 million. (See p. 10.) According to statistics compiled by the Office of Education, HEW, expenditures for federally financed research by all colleges and universities in the United States and its territories for the fiscal year 1968 were about 85 percent of the total expenditures for all research by these institutions and about 14 percent of their total operating funds from all sources.

The university receives, in addition to funds for research, large amounts of Federal funds for other purposes. The amount of support received by the university from Federal sources in fiscal year 1968 is summarized below.

<u>Purpose</u>	<u>Amount (millions)</u>
Research activities	\$48.6 ^a
Training grants	9.1
Student fellowships, tuition, stipends, and other grants-in-aid	3.9
Libraries	<u>.2</u>
Total--operations	<u>61.8</u>
Property additions and improvements	4.4
Advances for student loans	<u>2.2</u>
Total--nonoperations	<u>6.6</u>
Total	<u>\$68.4</u>

^aIncludes reimbursements of some fiscal year 1967 expenditures and advances for certain fiscal year 1969 costs.

Support from Federal sources represents a significant portion of the university's total operating funds. The \$61.8 million received in fiscal year 1968 from Federal sources represented about 28 percent of the university's total operating funds of \$224.4 million. The university's sources of operating funds for fiscal year 1968 were as follows:

<u>Source</u>	<u>Amount</u> <u>(millions)</u>
Federal Government	\$ 61.8
State appropriations	63.9
Student fees	25.5
Private gifts and grants	13.3
Income from investments	5.0
University income-producing activities (e.g., hospital, student residences, athletics)	<u>54.9</u>
Total	<u>\$224.4</u>

The above-mentioned HEW statistics indicate that, for all institutions of higher education in the United States and its territories, support in fiscal year 1968 from Federal sources, on a basis comparable with that shown above, represented about 21 percent of the total operating revenues of these institutions for that year.

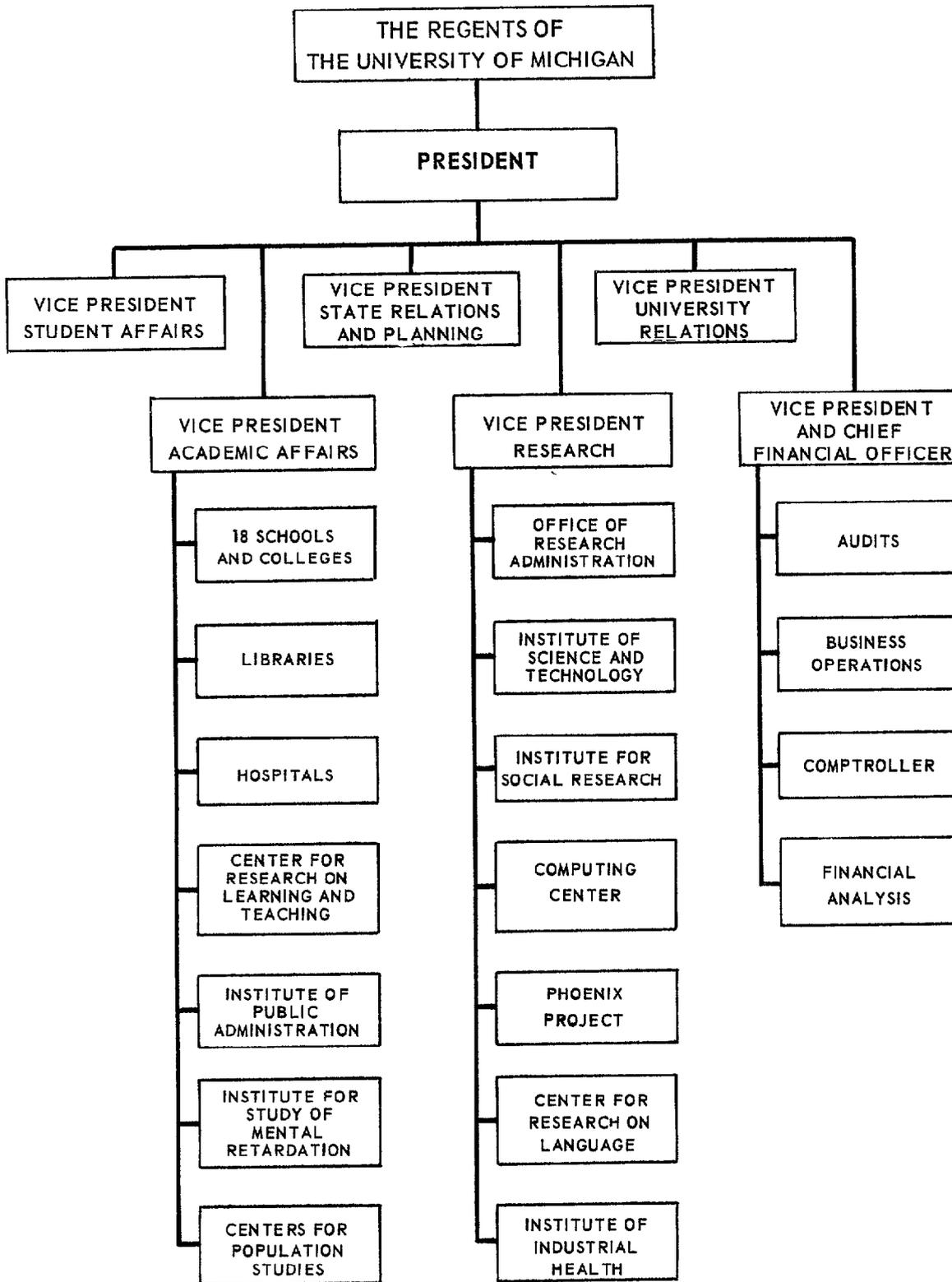
CHAPTER 2

ORGANIZATION OF UNIVERSITY RESEARCH ACTIVITIES

The research organizational structure of the university reflects policies, evolved during the early years of sponsored research, which emphasize using students in the research projects, bringing the results of research into the classroom, and avoiding routine testing work. As a result, most of the research projects are initiated and performed by the academic staff within the university's ~~various~~ ^{various} schools and colleges with a lesser number of them being initiated and performed in separate organizational units created especially to carry out research projects. This procedure provides a close integration of the research, in terms of both performance and results, with the academic or educational activities. Consequently the university does not have a rigid and centralized research organizational structure. Instead, the technical responsibility for research ~~resides~~ ^{resides} with the faculty members or researchers who initiate and direct ~~the~~ ^{their} projects, and the basic administrative control for research lies with the heads of the various departments or separate research units.

The university is controlled by a board of eight regents elected by the people of Michigan. The day-to-day operations of the university are directed by a president, selected and appointed by the regents, and by six vice presidents, including a vice president for research. The position of vice president for research was established by the regents in 1959 to coordinate the increasing volume of university research activities. The separate university organizations that have been created primarily for research activities are responsible directly to the vice president for research. The schools and colleges are responsible to a vice president for academic affairs, but their research activities are coordinated by the vice president for research. The following chart shows those organizations that are involved in research activities at the university.

UNIVERSITY ORGANIZATIONS
INVOLVED IN RESEARCH ACTIVITIES



The office of research administration, which serves as the administrative office of the vice president for research, is organized not only to support the sponsored research activities but also to serve as the university's coordinating point for other Federal programs (e.g., research, fellowships, and training grants). The services and activities of this office are organized into six broad categories: sponsored research and scholarly activities, sponsored training activities, program development, relations with industry, security and personnel, and administrative services. This office also makes research space and facilities studies; handles patent matters; and furnishes photographic, reproduction, and technical illustration services.

In addition, this office can provide a limited amount of financial support to members of the faculty seeking to develop outside support for an area of research in which they are interested but in which some preliminary research is necessary to serve as the basis for the preparation of a proposal. Other support in the form of office furniture, equipment, and minor physical modification to research facilities is available when such costs cannot be charged to individual research projects.

Individual project representatives within this office are assigned the responsibility of coordinating all research activities for specific agencies and industries. Each project representative devotes his attention to the requirements of the particular sponsoring agency assigned to him and keeps abreast of the sponsor's policies and programs in technical, scientific, and scholarly fields. The project representatives assist the faculty and other university research personnel in determining sources of support, preparing and processing proposals, and administering projects.

Business services for sponsored research activities--including accounting, purchasing, property, travel, and timekeeping--are provided by the offices under the vice president and chief financial officer. Because there are many special activities and services associated with sponsored research projects, several of these offices specialize exclusively in service activities for sponsored

research and are physically located within the office of research administration.

The ~~various~~ schools and colleges play a prominent role in the research activities. Their projects make up the majority of the university's research. All 95 departments of the university's 18 schools and colleges perform classroom instruction and research. The projects are performed by individual teaching faculty members who devote a portion of their time to research. This research is generally carried out in laboratories or other facilities in the faculty member's teaching department.

As an administrative convenience, many separate research units have evolved within the departments of the schools and colleges. By assuming an independent existence with supporting staff, the research unit is able to relieve the faculty members of administrative detail. These departmental research units range from informal ad hoc groups with only departmental sanction to large, long-term, multidisciplinary units officially established by the regents. The Medical School and the College of Literature, Science, and the Arts each has more than 30 research units variously termed institutes, bureaus, centers, or laboratories. In 1967 the College of Engineering alone had more than 60 such research units.

Although the various schools and colleges play a major role in research, the university has created several independent organizations primarily for research activities. Each of these organizations is headed by an executive committee responsible to the vice president for research or the vice president for academic affairs. The organizations have staffs of full-time researchers and sufficient autonomy to allow them to undertake large-scale and long-term research programs. Although the units have research as their primary mission and are independent of the academic activities, they are nevertheless united with the university's general educational aims. They use students in performing research, furnish classroom lecturers, and provide teaching faculty members with an opportunity to work on research projects. Two of the more significant multidisciplinary research organizations are discussed below.

The Institute of Science and Technology was established in 1959 to provide an organizational structure for the administration of large and complex research programs of several research laboratories. During fiscal year 1968, this organization had a total of 1,040 persons working on research projects. The largest research unit of the institute is the Willow Run Laboratories (WRL), Ypsilanti, Michigan, which operate almost entirely under defense contracts involving large research projects in such matters as battlefield surveillance, radar and infrared technology, seismology, optics, communications, and navigation. The institute also maintains three centers which serve as national clearing houses for both classified and nonclassified information on infrared technology, seismic detection of underground nuclear explosions, and ballistic missile radiation detection. In addition, the institute has other units which perform research in biophysics, engineering psychology, highway safety, glacial geology, industrial development, and industrial systems, as well as research on the Great Lakes.

A similar-type organization is the Institute for Social Research, established in 1946 for the study of human behavior. Its staff of research and administrative personnel averaged 300 during fiscal year 1968. Its research activities are carried out through three major divisions-- Survey Research Center, Research Center for Group Dynamics, and Center for Research on the Utilization of Scientific Knowledge. These centers are concerned with research in the areas of mental health in industry, organizational behavior, economic behavior, political behavior, intergroup relations, and interpersonal relations.

CHAPTER 3

TYPES OF RESEARCH

The first systematically sponsored research program at the university was undertaken in the College of Engineering in the 1920's and was sponsored by private industry. Since that time, sponsored research has expanded to the point where virtually all units of the university are conducting such research in a wide range of disciplines. Today research is sponsored by a variety of sources--principally industry, foundations, and Government--of which the largest is the Federal Government.

Most of the research projects at the university involve basic research. The typical research project is concerned with one specific area of interest and is carried out in one of the various colleges or schools by a principal investigator, usually a faculty member, and one or more graduate students. Other research projects, more general in nature, are undertaken by departments, laboratories, or special interdisciplinary units established by the university primarily to conduct research. These projects may have more than one principal investigator but are usually coordinated by a department chairman, laboratory chief, or group leader who takes responsibility for the full activity.

During fiscal year 1968, a total of \$62.1 million was expended for research by all units of the university. The broad areas in which the research was performed are shown below.

	<u>Amount</u> <u>(millions)</u>	<u>Percent</u>
Life sciences	\$19.3	31.0
Engineering	18.0	29.0
Physical sciences	12.5	20.2
Social sciences	10.0	16.1
Humanities	0.6	0.9
All other fields	<u>1.7</u>	<u>2.8</u>
Total	<u>\$62.1</u>	<u>100.0</u>

The wide range of disciplines in which research is performed is further illustrated by the following table of units that expended \$1 million or more during fiscal year 1968.

<u>College or school unit</u>	Total research expenditures (millions)
Department of Electrical Engineering	\$4.8
Department of Physics	2.8
Department of Internal Medicine	2.2
Department of Aerospace Engineering	1.9
Department of Epidemiology	1.6
Department of Mechanical Engineering	1.5
Department of Psychology	1.5
Department of Human Genetics	1.0
Department of Surgery	1.0
 <u>Separate research unit</u> 	
Institute for Social Research	4.9
Infrared Physics Laboratory	3.9
Radar and Optics Laboratory	2.6
Mental Health Research Institute	1.8
Highway Safety Research Institute	1.6
Infrared and Optical Sensor Laboratory	1.3
Radio Science Laboratory	1.1
Population program centers	1.0

Not all research projects result in tangible benefits, because basic research, by its very nature, explores the unknown and the results cannot be foretold. In many cases, project findings provide only a basis for further research in the area under study or in related areas. Such research, however, produces various unmeasurable benefits, such as training of scientists, knowledge for use in the classroom, and indications of possible alternative methods for future research.

The following two examples of research efforts at the university illustrate some of the types and results of research and how that research tends to perpetuate itself through the development of new ideas.

1. A research program is being carried out by the Department of Epidemiology, School of Public Health, to study the distribution of disease and disability within a community and to develop, formulate, and conduct investigations into factors possibly related to the development of various chronic diseases, including coronary heart disease, diabetes, hypertension, chronic pulmonary disease, and rheumatic disorders. The ultimate aim is earlier detection of these diseases and, where possible, their prevention.

In 1956 the Department of Epidemiology used some of its university funds to initiate the study and selected Tecumseh, Michigan--a community of about 9,800 persons--as the test area. Subsequent financial support of the central structure of the study has been provided by the National Institutes of Health. Various individual research areas emanating from the basic study are financed by the Federal agencies, such as the National Heart Institute, which are concerned with particular diseases.

The first fieldwork began in 1957, and since that time three rounds of physical examinations and laboratory tests have been given to most of the community's population to evaluate the status of current or chronic illnesses and to observe and record changes in the health conditions and diseases noted. The study's headquarters and one of its activities are shown in the photographs on pages 20 and 21.

Although the ultimate aim of this study is to make the earliest possible diagnosis of approaching disease in apparently healthy persons, many special studies have been integrated into the program. For example, specific investigations were made of cystic fibrosis, tuberculosis, and arterial disease while general studies were made of the relationship between health and physical fitness, the environment of the study area, and the sociological aspects. Many of the studies and investigations undertaken are still in progress; other studies have been

completed and the results made known to the medical and scientific community. The first publication of findings from the study appeared in print in 1958. Since that time over 120 reports have been published in scientific journals.

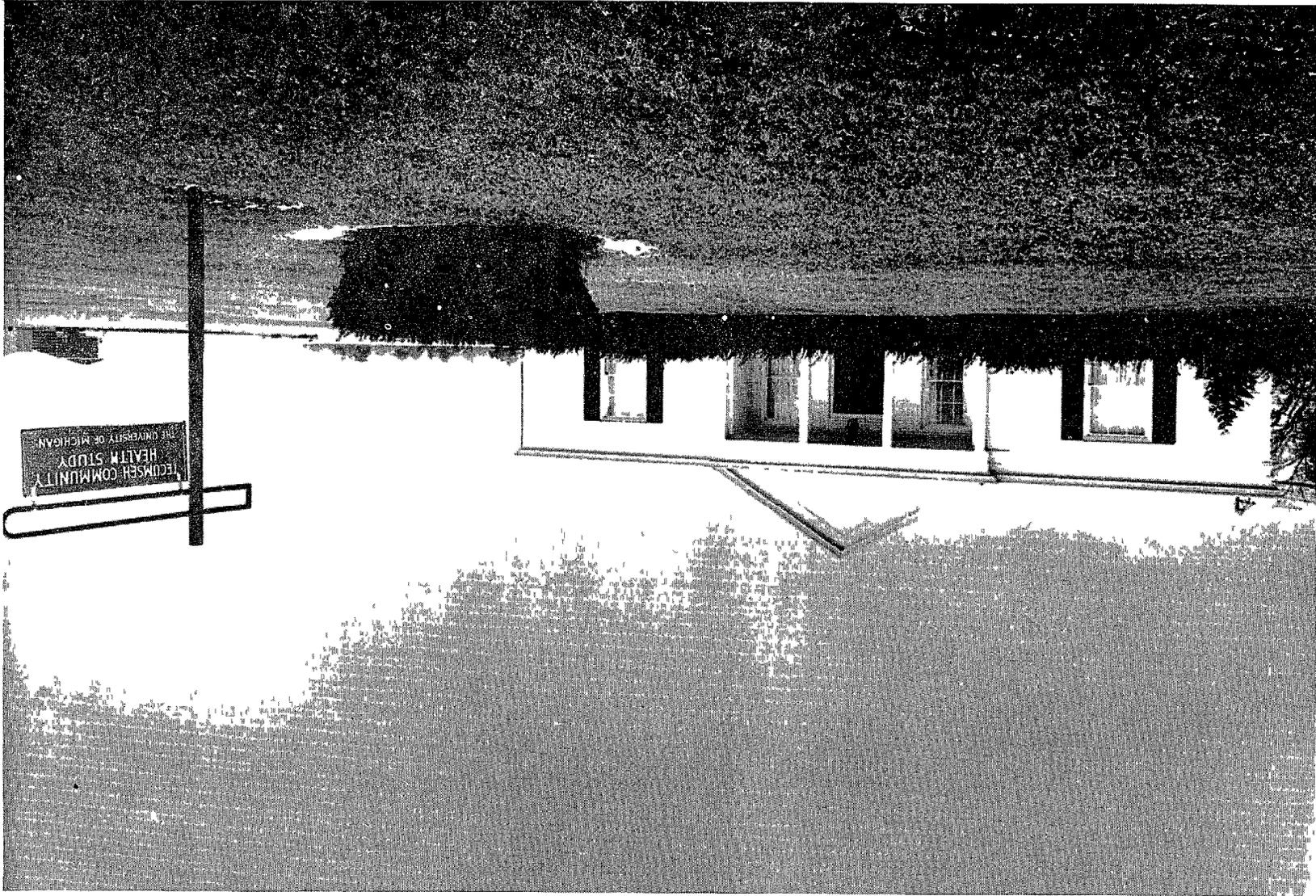
The study has yielded, in addition to the benefits to medical research, much information valuable for teaching purposes. It has also provided field training for students and teachers in many aspects of medicine and public health. Many students, particularly those of the School of Public Health and the School of Dentistry, have made some part of the study the subject of their doctoral research.

2. Intensive, large-scale research into infrared sensing has been carried out at the Willow Run Laboratories since 1953. Until recently, most of the financial support for this research was provided by the various agencies of DOD, primarily because of the research's potentialities acquiring military information, particularly surveillance and reconnaissance information.

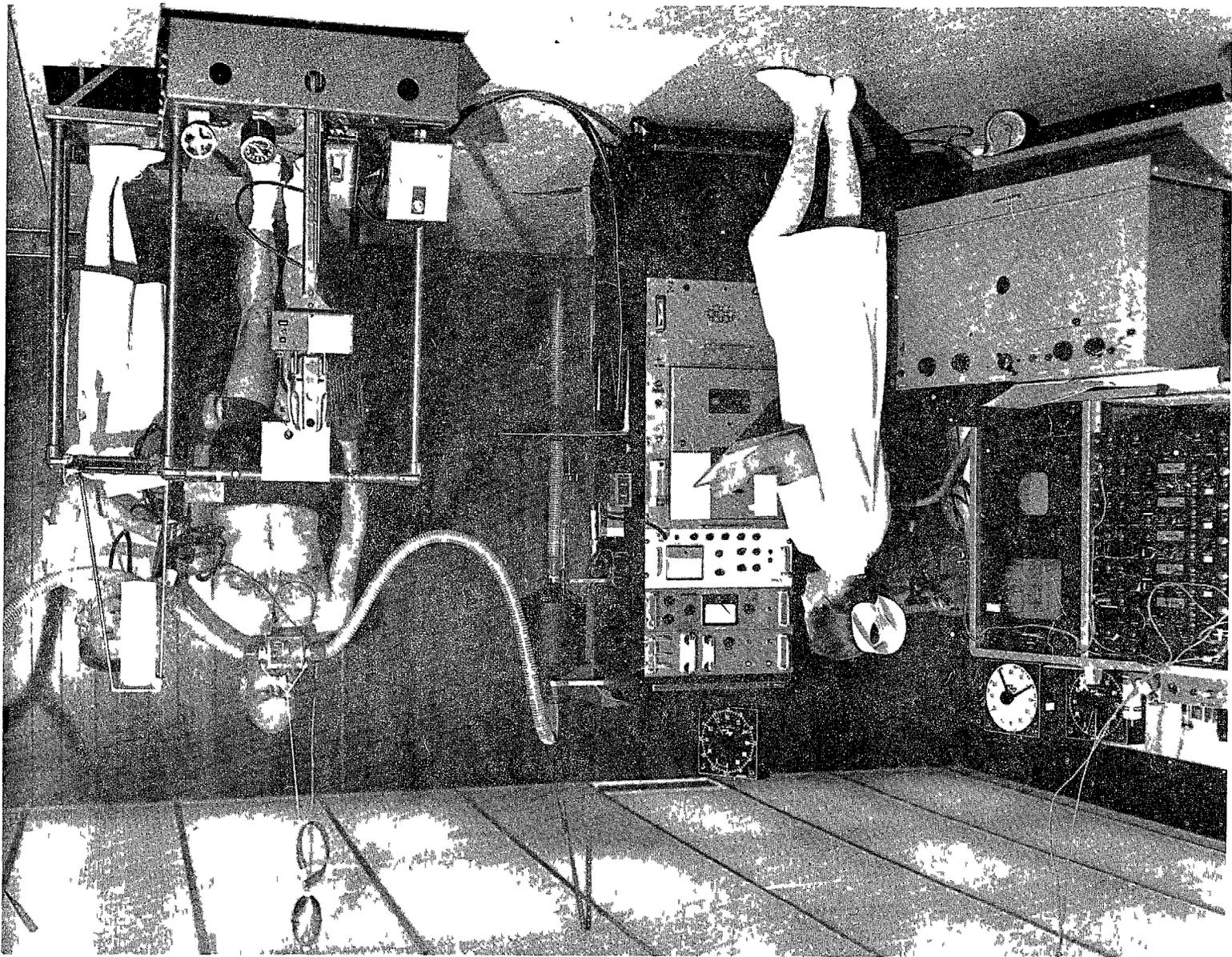
Infrared sensing exploits the fact that everything above absolute zero (-459° F.) emits infrared radiation in quantities and at wavelengths that depend on the nature of the surface and its temperature. This radiation can be recorded by an infrared scanner which produces an image on film that in certain respects resembles a conventional photograph. Illustrations of infrared images are shown on pages 23 and 24.

With the knowledge of military applications and the refinements gained through basic research, the university has turned to the development of nonmilitary uses of infrared sensing, and much of the current research is being financed by the nonmilitary Federal agencies. Of particular significance is the remote sensing of environment, of which the following examples are intended merely to show the wide range of applications that can be made of knowledge gained in basic research.

The study's headquarters in Tecumseh, providing clinic space for the medical examinations and offices and workrooms for the interviewing staff



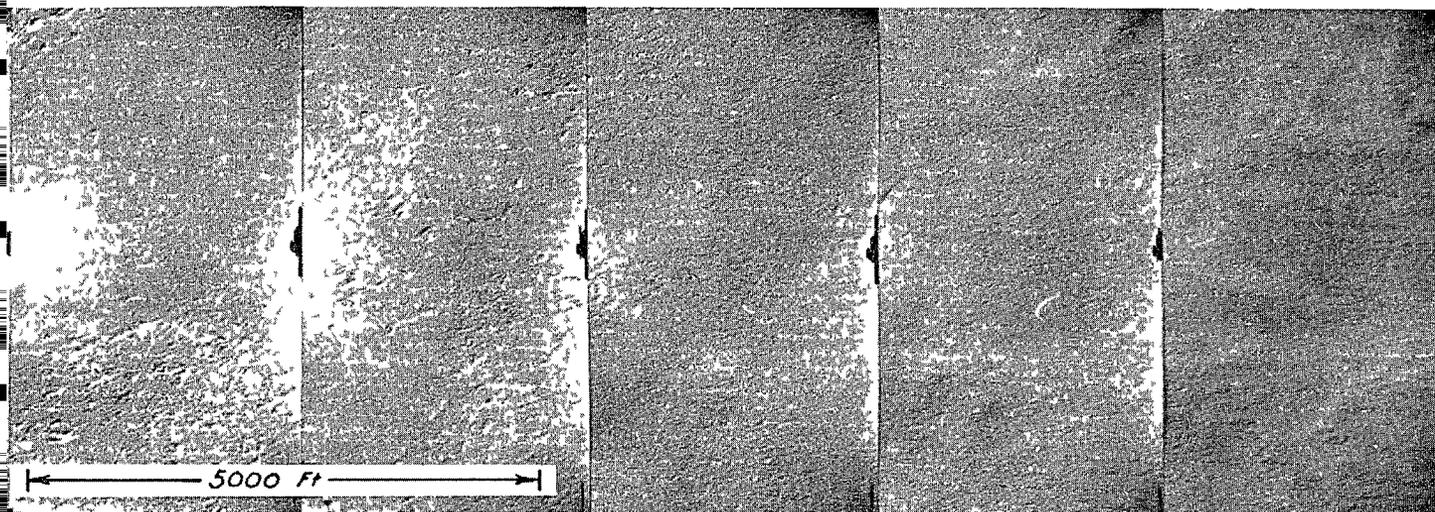
In this picture the subject is participating in the study of exercise physiology



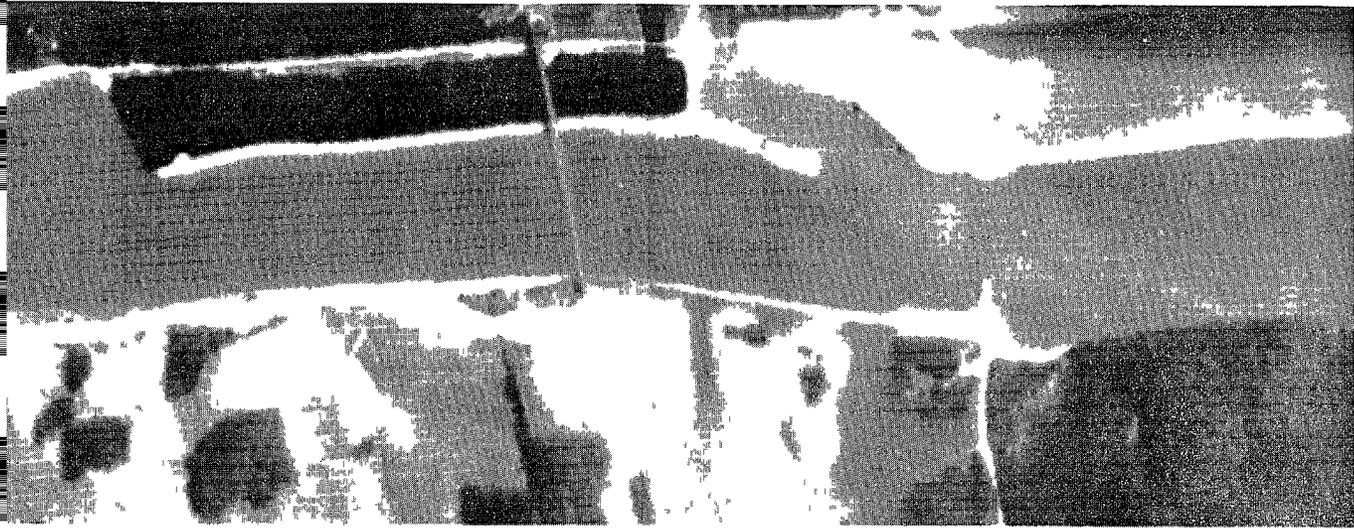
The university's research indicates that infrared detection promises to make the evaluation of ice thickness more precise and more reliable. In polar studies, infrared sensors have demonstrated their value in detecting snowbridges or large snowfields. In studies involving the detecting and mapping of forest fires, the researchers found that infrared sensors were capable of spotting small fires before they had time to get out of control. The university has used infrared sensing to study volcanoes, determine the temperature of water, and map currents in physical oceanography studies. Researchers have found also that infrared detectors are useful in taking censuses of animal populations. The university is now studying potential use of infrared sensing by urban planners in land use studies and urban area analysis.

The university is also studying potential use of infrared detectors on space vehicles, such as the Apollo, to obtain a rapid, large-scale inventory of crops that would determine the health of the crops, how much they could be expected to produce, and when they would be ready for harvest.

In 1963 the university admitted its first candidate for a doctoral degree having remote sensing of environment as a major area of training and research. A master's degree with opportunity to specialize in remote sensing is available in several of the university's departments. The number of students pursuing advanced degrees in this field has increased steadily, and new courses have been added to meet their particular needs. Students in such a program conduct, in addition to formal course work, research in several areas, usually in cooperation with WRL.



RARED DETECTION OF A SNOW-COVERED, ICEBOUND COASTLINE The coastline, completely hidden in the conventional aerial photographs (top), is clearly visible in the infrared imagery (bottom)



SPRING These infrared images of a river were made for the Tennessee Valley Authority which wanted to determine the diffusion of cold water released into the river from a dam. Both images are of a portion of the river 20 miles downstream from the dam. The top image shows the river's normal appearance in the morning. The dark strip along the bank is the water behind a retaining wall. The bottom image, made 23 hours after the dam was opened, shows that the cold water, which is a sharply defined front, has reached this point.

CHAPTER 4

IMPACT OF RESEARCH

Federally financed research projects at the university assist in the accomplishment of national goals and agency missions through the creation of new knowledge and the discovery of new practical uses of knowledge. They assist also in the efforts of researchers and scientists because, as a general rule, each agency encourages wide dissemination of the knowledge gained in the projects. Project results are disseminated by university researchers through technical reports, articles in technical and professional journals, dissertations at scientific symposia and conferences, and theses published by graduate students. Federal agencies require that researchers' publications of project results include acknowledgments that the research was federally supported. All such publications we reviewed included these acknowledgments.

Research yields, in addition to the benefits to the Government and the scientific community, a variety of benefits to the university itself. These benefits, as described by university officials, are enumerated below.

- New knowledge gained from research and integrated with existing knowledge invigorates and gives a timely quality to modern-day teaching. This new knowledge also provides our society, both directly and through its university-trained citizens, with the tools, techniques, institutions, and ideas it needs to meet the requirements of the times.
- The availability for salaries of funds from research awards permits an extension of the university staff beyond the capability derived from State general funds. Over half the expenditures of sponsored research projects at the university go for salaries of the principal investigators and research assistants.
- A related benefit to the university from a strong, sponsored research program is the capacity to attract and retain high-quality faculty. The

life-style of the best professorial talent today includes research. The university's best teachers are often those whose vitality is derived from their own research which carries them to the frontier of knowledge. They cannot be attracted or retained by universities which do not provide research opportunities, and these opportunities cannot be offered without mobilizing resources from both State supported and sponsored research.

--The faculty and the physical resources which the university has been able to assemble with the aid of research support are, in large measure, responsible for the high national and international esteem in which the university is held. For example, a survey conducted by the American Council of Education in 1966 showed that all the university's departments included in the survey were rated either "distinguished" or "strong," the two highest classifications. Only five other universities shared this distinction, and each of these had a similarly strong research program.

--Research projects, many of which are concerned with advanced theory and technology, constitute a natural and highly necessary focus for graduate-student training. It can be categorically stated that the university could not maintain graduate programs in so many areas and in such depth nor could it prepare so many of the badly needed advanced scholars without the staff, the facilities, and the activity made possible by the sponsored research program. This is especially applicable to doctoral programs in engineering, chemistry, physics, mathematics, medicine, public health, and psychology. In 1967-68, the university awarded 548 doctoral degrees plus 1,026 graduate professional degrees (e.g., doctor of medicine and doctor of dentistry degrees) and 3,015 master's degrees. The majority of the doctoral degrees were awarded to students who had been involved at one time or another with a sponsored research project.

--Research projects provide student employment. Many graduate students could not complete their education without the financial assistance made possible by appointments as research assistants. In 1967-68, about 3,500 students were on project payrolls.

University officials have advised us that research projects at the university invigorate the local and State economy. They have stated that industry, particularly new industry, is attracted to areas where universities have research programs. According to the officials, research at the university is the magnetic influence that has drawn several industrial research laboratories to the Ann Arbor area.

The substantial involvement of higher educational institutions in Federal research programs has prompted congressional concern as to the impact of such research on the institutions' teaching function. On the basis of a study of the matter, the Committee on Government Operations, House of Representatives, issued a report entitled "Conflicts Between the Federal Research Programs and the Nation's Goals for Higher Education" (H. Rept. 1158, October 13, 1965). The Committee found that college enrollments were rising and that the shortage of teachers was becoming acute. The Committee concluded that Federal research and development programs had unquestionably improved scientific higher education in some particulars, principally graduate education. The Committee further concluded, however, that the programs had also harmed scientific higher education

--by drawing scientific manpower into noneducational employment rather than teaching;

--by diverting university science teachers to research and away from teaching, particularly undergraduate teaching;

--by being concentrated in a few large universities, to the detriment of science education in small institutions, without yielding compensatory returns in the training of young scientists; and

--by neglecting the social sciences and humanities.

The Committee considered the effects of Federal research from a nationwide standpoint, and its conclusions pertained to higher education in general rather than to a specific college or university. The Committee's report pointed out that strong, well-financed institutions had been able to maintain an equilibrium between research and teaching (1) by insisting that their senior professors continue to do undergraduate teaching and (2) by hiring enough additional faculty to offset any diversion of time for research.

We did not attempt to determine whether the University of Michigan had maintained an equilibrium between research and teaching, because opinions differed as to what constituted an equilibrium. We obtained statistics, however, on the allocations of faculty effort and the extent to which teaching was done by senior faculty members.

During fiscal year 1968, about 800 of the 4,300 members of the teaching staff were directly involved to some extent in research. (Detailed information on the number and types of university research employees is contained in ch. 6, p. 48.) The percent of time that the typical full-time equivalent teaching staff member of each rank spent in instruction, research, and other professional activities in the fall term of 1968, as recorded by the university's office of institutional research, is shown in the table below.

Percent of Time Spent
by the Typical Full-Time Equivalent Teaching
Staff Member in Various Professional Activities
in Fall Term 1968 (note a)

<u>Teaching rank</u>	<u>Type of activity and percent of time</u>				<u>Total</u>
	<u>In-</u> <u>struction</u>	<u>Re-</u> <u>search</u>	<u>Adminis-</u> <u>tration</u>	<u>Other</u>	
Professor	50	23	22	5	100
Associate professor	53	27	17	3	100
Assistant professor	60	26	12	2	100
Instructor	80	11	8	1	100
Lecturer	67	23	9	1	100
Teaching fellow	92	6	1	1	100
All ranks	65	19	13	3	100

^aExcluding teaching staff members of the Medical School.

The table above shows that senior faculty members (i.e., members of the rank of assistant professor or higher) devoted 50 to 60 percent of their time to instruction. It shows also that the higher these members' rank, the smaller the percent of time they devoted to instruction. The following table shows that senior faculty members' instructional activity was directed primarily to graduate, rather than undergraduate, students.

Percent of Student Credit Hours
Taught by Senior Faculty (Assistant
Professor or Higher)
Fall Term 1968

	<u>Percent</u>
Undergraduate students:	
Freshmen and sophomores	40
Juniors and seniors	64
Graduate students:	
Masters	84
Doctors	91
Graduate professionals	88

According to a university official, the small percent of undergraduate teaching by senior faculty members was attributable, in part, to a large increase in student enrollment in recent years. He stated that a basic course, such as English 1, might consist of 30 sections. As a result, he said, more teaching must be done by graduate students, primarily in the beginning courses. Nevertheless it seems obvious that a reduction in research activity would permit senior faculty members to do more undergraduate teaching.

On this point, the university's beliefs as to its functions are of paramount importance. According to university officials, the university's general functions include not only teaching but also public service and the advancement of knowledge. Although these officials consider research to be highly beneficial to graduate teaching, they consider research to be beneficial also to public service and indispensable to the advancement of knowledge. In fact, the university considers research so important to its objectives that it expects that a faculty member will engage in research as a regular part of his scholarly activity.

CHAPTER 5

RESEARCH FACILITIES

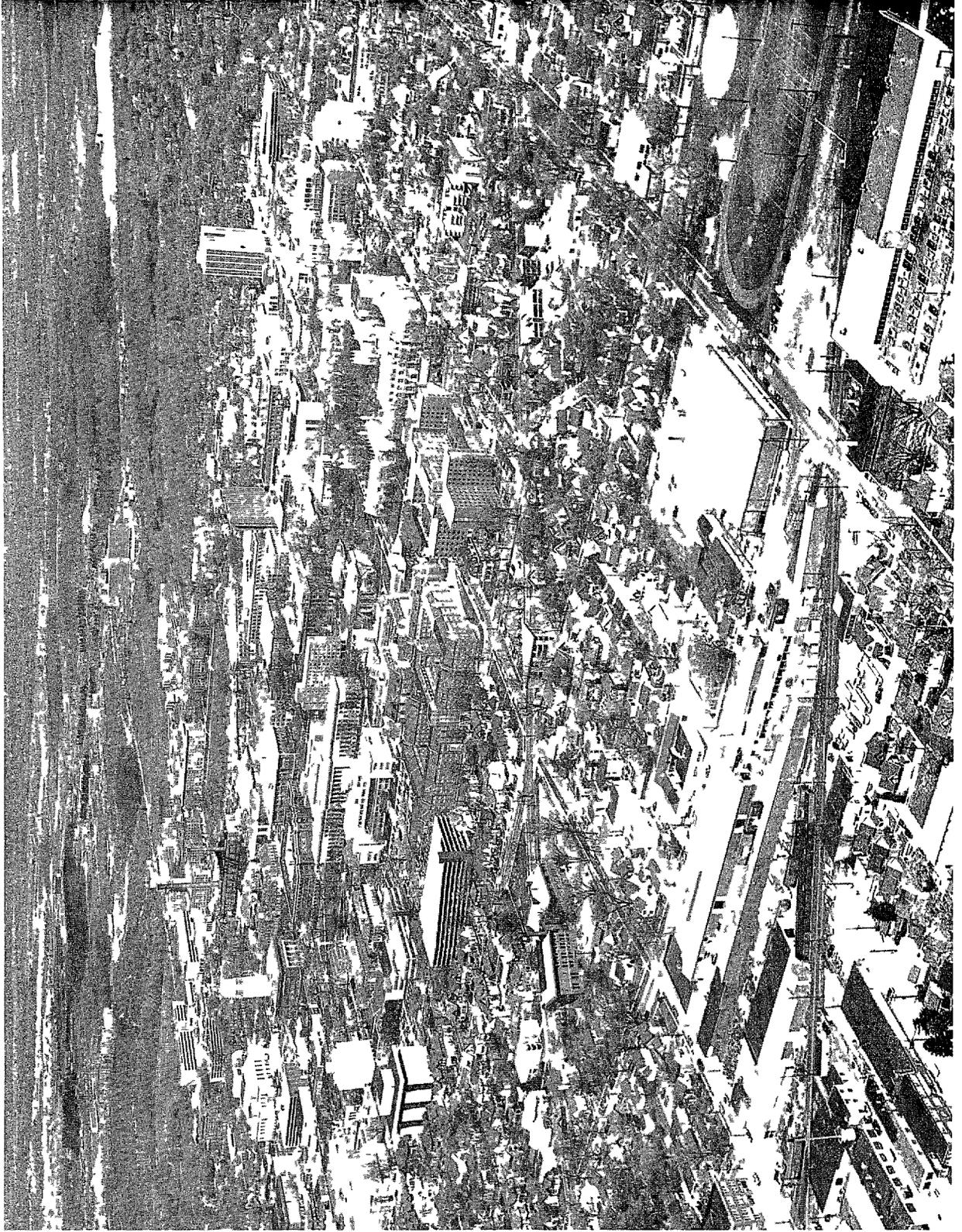
Significant amounts have been invested at the university in constructing and equipping physical facilities to house and support instructional and research activities. As of June 30, 1968, the university's buildings and equipment were valued at about \$318.2 million. They consisted of about 150 buildings valued at about \$227.7 million and equipment valued at about \$90.5 million. The magnitude of research at the university requires the extensive use of these facilities for research purposes. In addition, Federal agencies have provided the university with about \$22.5 million worth of Government-owned equipment exclusively for use in research activities.

BUILDINGS

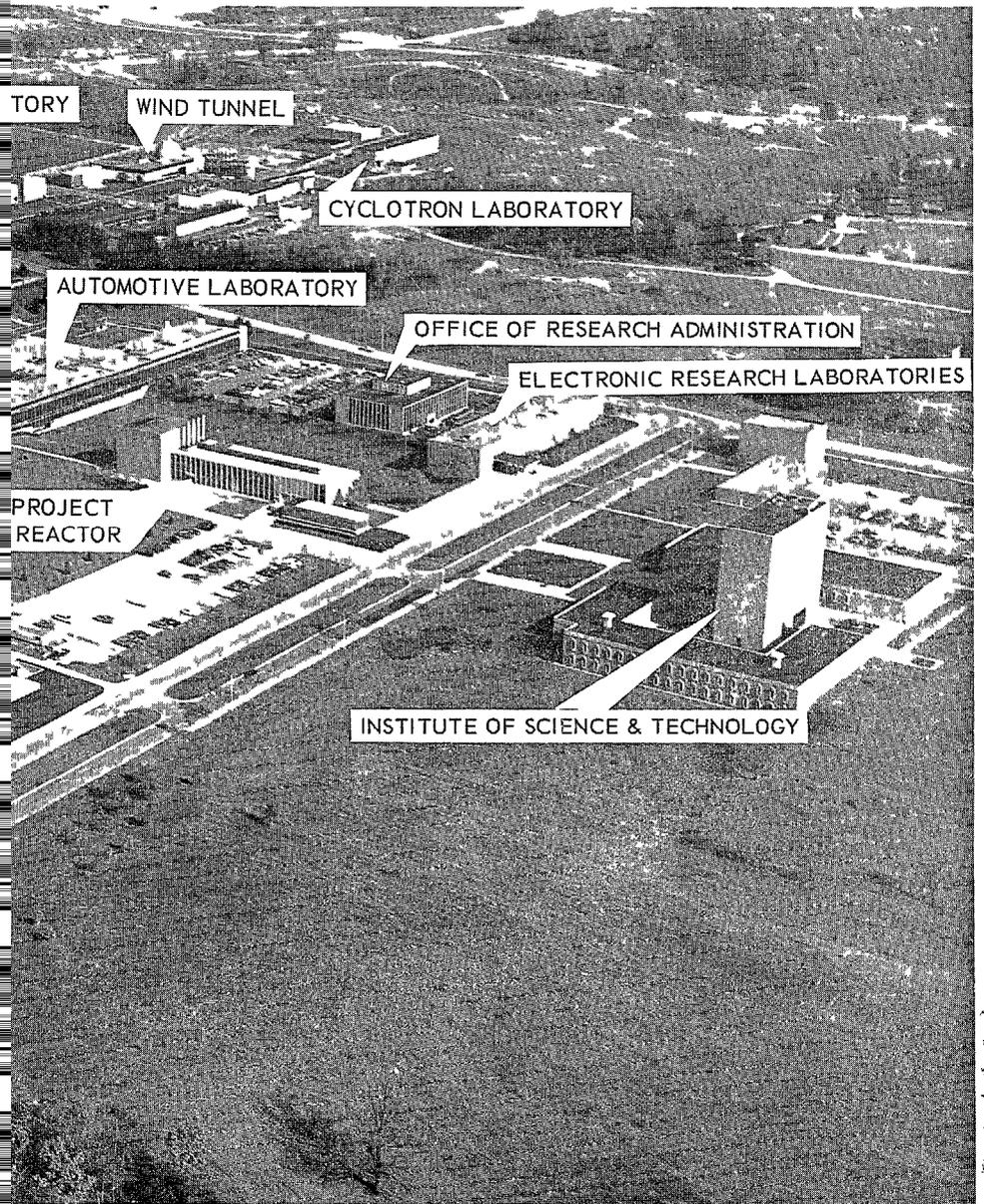
Most of the university's buildings are located on the Main and North Campuses in Ann Arbor. The Majority of the remaining buildings are located at the Willow Run Laboratories which are about 14 miles from the Main Campus. The Main Campus area includes most of the university's classroom buildings, a medical center complex, and several buildings devoted primarily to sponsored research activities. Many of the classroom buildings include laboratories and other facilities in which research is performed. The North Campus area is occupied primarily by laboratory buildings used for research activities. The buildings located at WRL are used exclusively for research purposes.

Photographs of the university's Main and North Campuses and WRL are shown on the following pages.

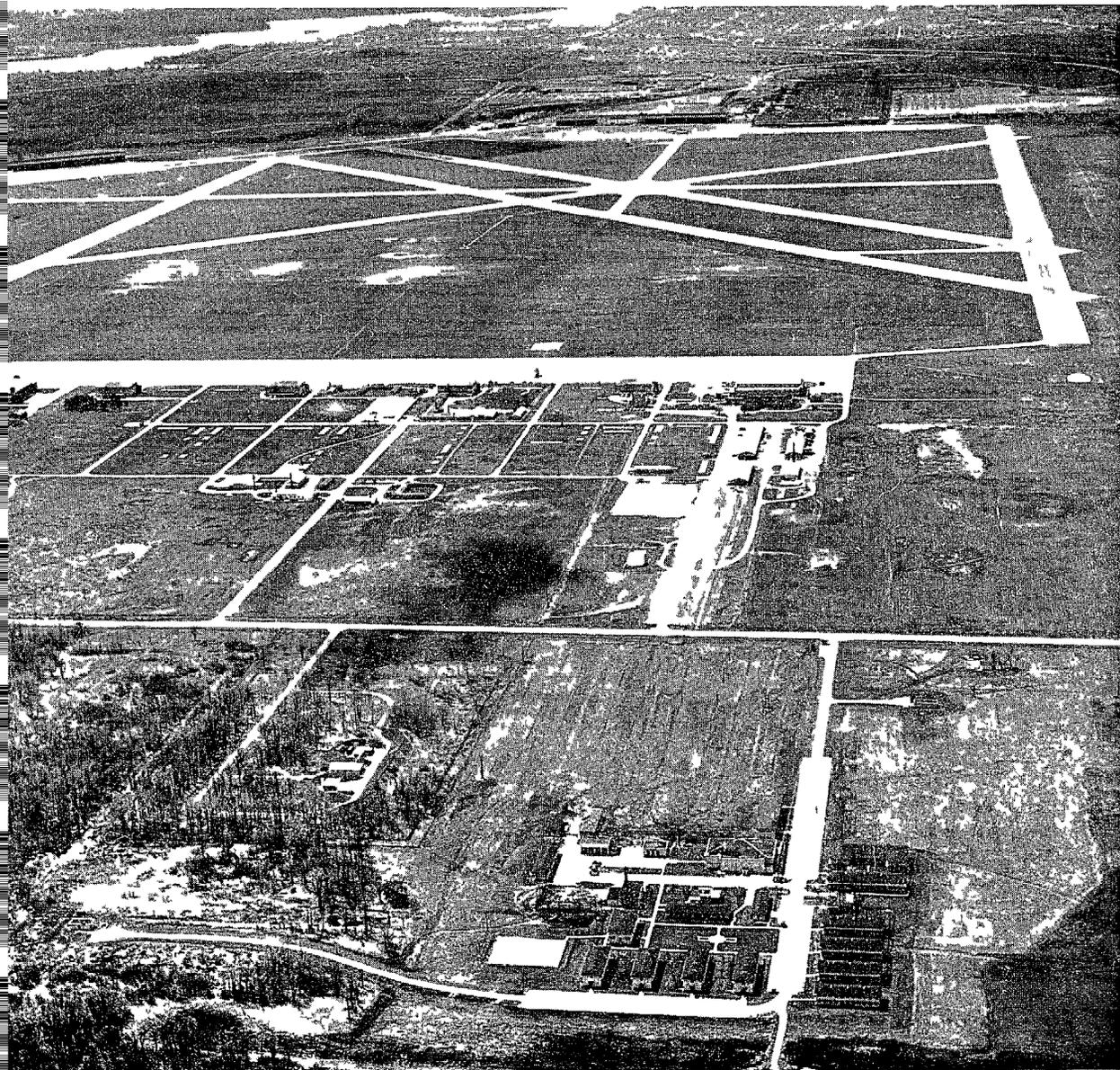
The university made a space utilization study of all its buildings in 1967, which showed that about 1.6 million square feet of space were being used for instruction and that about 1.3 million square feet were being used for research activities. Of the 1.3 million square feet used for research, about 1.1 million were located on the Main and North Campuses and about 0.2 million were located at WRL.



Main Campus



North Campus



Willow Run Laboratories and Airport

During the period January 1957 to December 1968, inclusive, Government agencies approved grants totaling about \$26.3 million to construct research and teaching facilities at the university. The majority of these funds was for the construction of research facilities of which a substantial portion--about \$13.9 million--was for the construction of research facilities in the health sciences area. In most instances construction funds provided by Government agencies must be matched by the university. The matching funds may be from the university's State-supplied funds or from other sources, such as private individuals, foundations, or industry.

Generally the Government contributes 50 percent of the construction cost of those portions of the buildings or additions which will be used for research. Since most buildings are used to varying degrees for purposes other than research, the percentage of Government funding is generally less than 50 percent of the total construction cost of the buildings. The following listing shows most of the buildings used for research to which the Government had contributed construction funds, as of December 31, 1968.

<u>Name of building</u>	<u>Total cost</u>	<u>Government funded</u>	<u>Percent Government funded (note a)</u>
(000 omitted)			
Kresge Medical Research Building	\$6,935	\$1,655	24
Institute of Science and Technology	2,816	405	14
Public Health Building	2,093	688	33
University museums	1,978	1,000	51
Institute for Social Research	1,881	567	30
Space Research Laboratory	1,425	1,425	100
Pharmacy Research Building	1,121	322	29
North University Building (computing facility)	1,008	40	4
Mental Health Research Building	1,065	510	48
Simpson Memorial Institute	831	130	16
L.D. Buhl Research Center for Human Genetics	564	257	46
Animal Research Facility	510	207	41

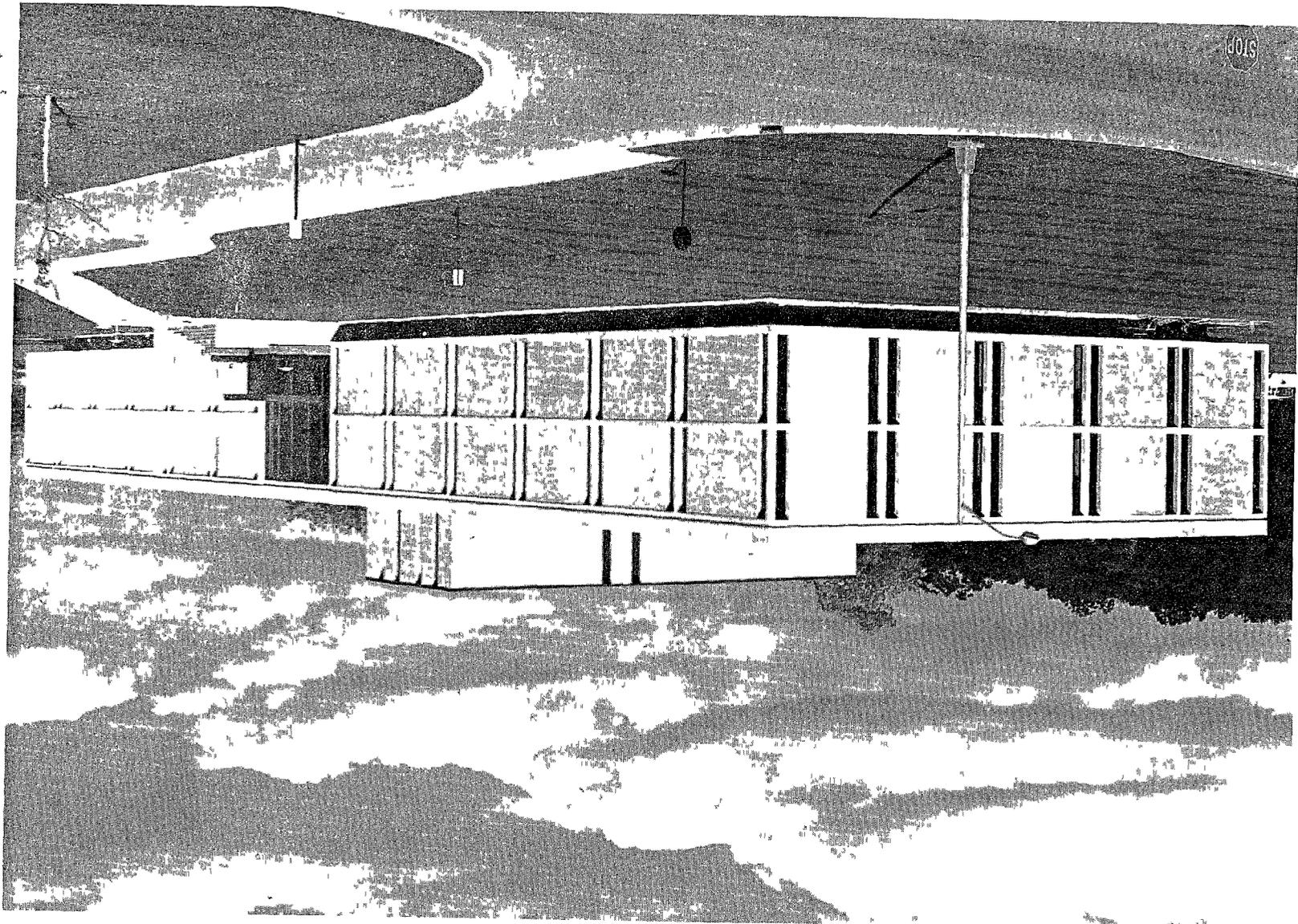
^aFor some of the above structures, Government funding was for additions or improvements to existing buildings constructed years ago at cost levels much less than those at the time of Government funding. Therefore the percentages shown are not indicative of the extent of Government funding in relation to total cost for such structures.

Although construction grants for research buildings are usually given on a matching basis, NASA financed the entire cost of the university's Space Research Laboratory. This building, completed in 1965, houses several laboratories in which space research projects are performed. (See photograph on p. 36.) The Space Research Laboratory, which cost NASA about \$1.4 million, was given to the university.

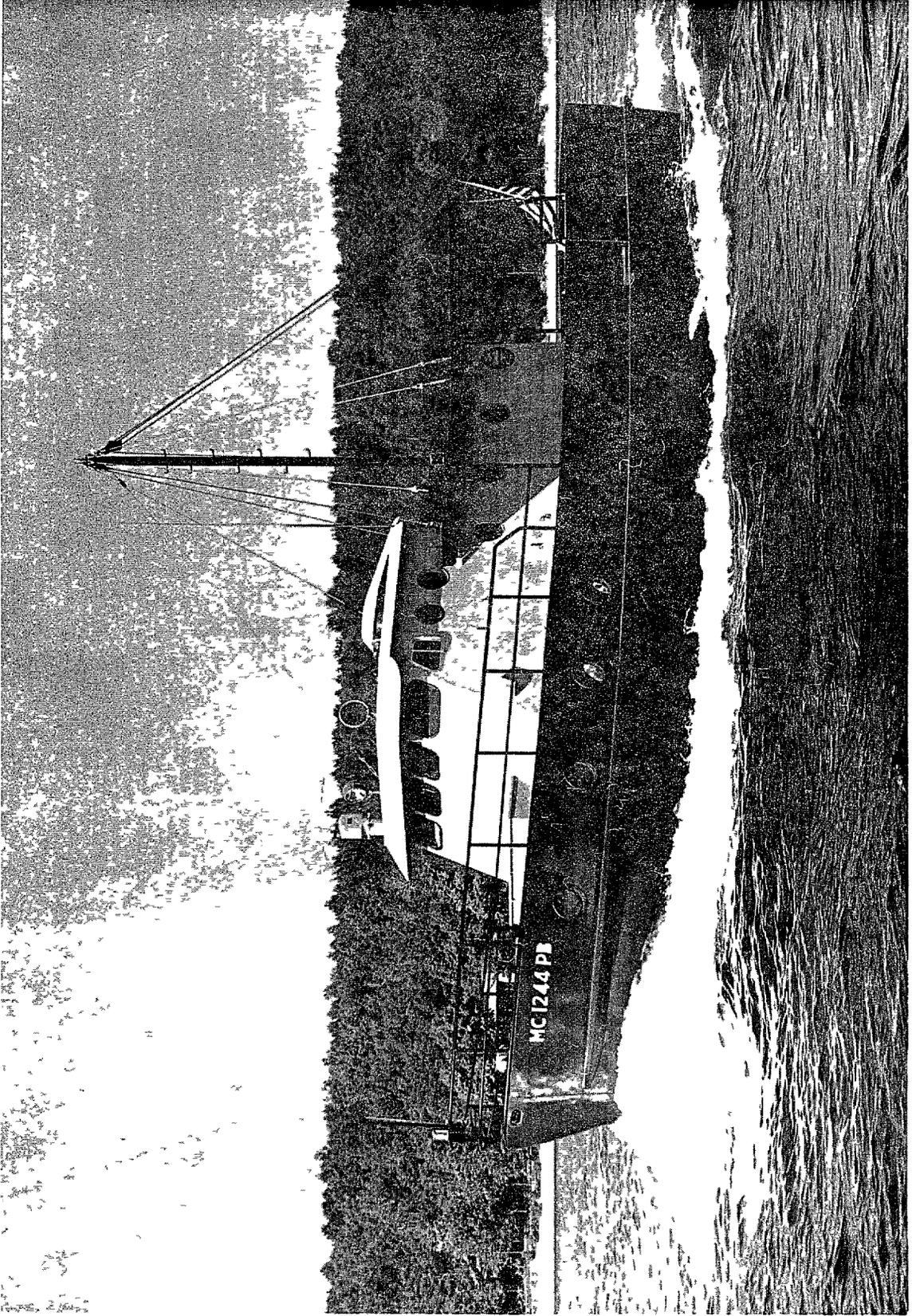
The university also owns and operates two ships for research work on the Great Lakes. (See photographs on pp. 37 and 38 .) These "floating laboratories" are used in performing research projects concerning the physical, chemical, and biological processes in the lakes.

In addition to granting the substantial amount of funds for construction of research buildings, in fiscal year 1948 the Government sold to the university, for the sum of \$1, the Willow Run Airport which included 25 buildings with about 0.2 million square feet of space that now house WRL. (See photograph on p. 33.)

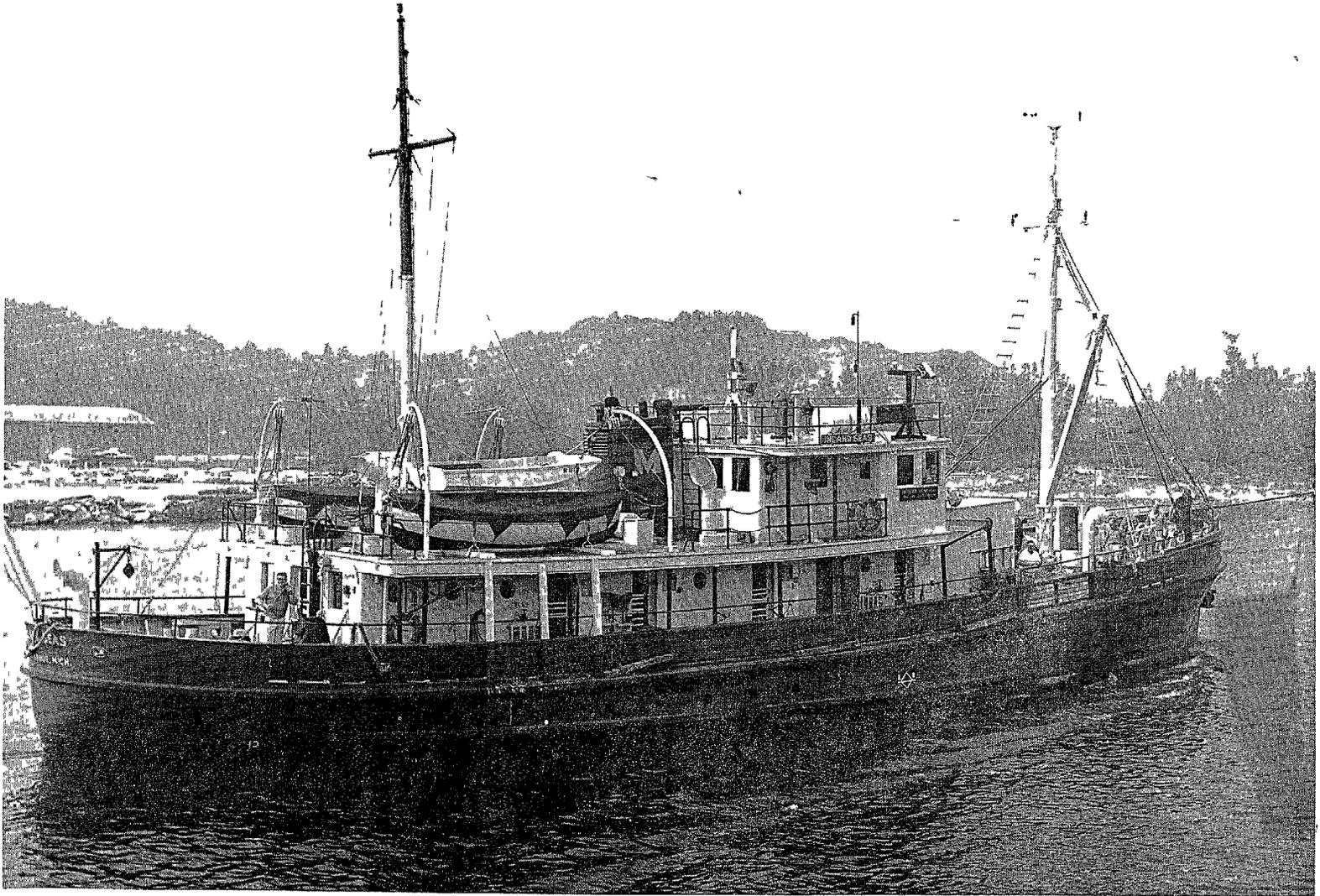
The university also operates the Government-owned Mount Haleakala Observatory on the island of Maui in Hawaii. (See photograph on p. 39.) This facility was constructed and equipped by DOD at a total cost of about \$3.8 million. It is operated by the university for tracking ballistic missiles and satellites and for astronomical and geophysical research studies of infrared energy from celestial sources.



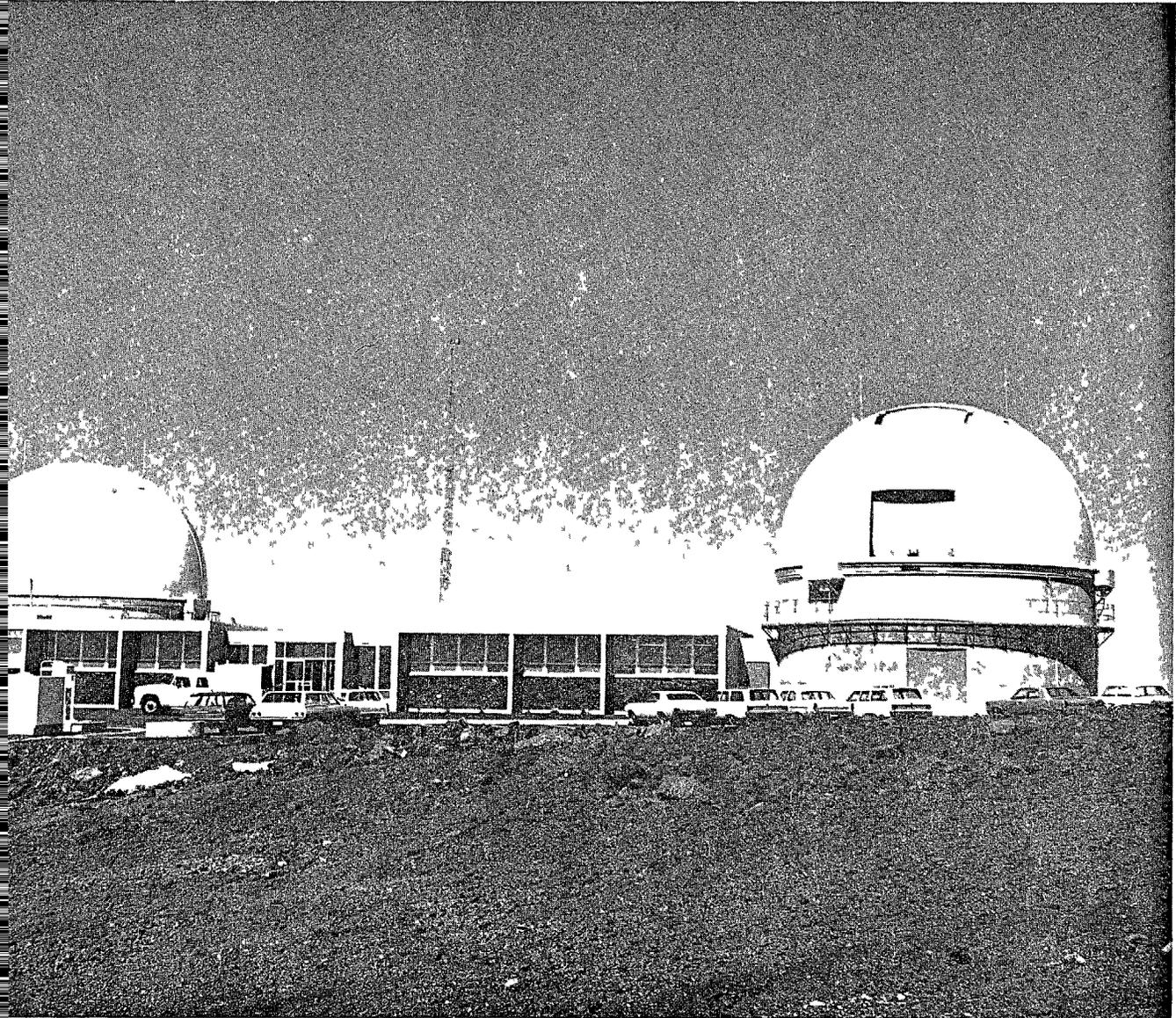
University-owned Space Research Laboratory on North Campus Entire construction funds provided by the National Aeronautics and Space Administration



The ship Mysis was built for the university in 1963 with funds totaling about \$86,000 from the National Science Foundation



The ship Inland Seas was purchased by the university in 1961 It was reoutfitted with funds totaling about \$69,000 from the National Science Foundation



Government-owned Mount Haleakala Observatory in Maui, Hawaii Built and operated by the University of Michigan for the Army Advanced Research Project Agency

EQUIPMENT

The university has defined equipment as an item costing in excess of \$25 (recently increased to \$100) with a useful life of over 1 year and that is not used as a part of an end-item. Most of the university-owned instructional and research equipment, valued at about \$90.5 million, is located throughout the ~~various~~ schools, colleges, departments, and units on the Main and North Campuses. It includes about \$15.1 million worth of equipment which the Government either (1) paid for under construction grants, research grants, and contracts or (2) purchased and subsequently donated to the university. In either case, title to the equipment has been passed to the university.

The \$15.1 million worth of university-owned equipment purchased with Government funds represents about 17 percent of the total \$90.5 million value of university-owned equipment. As shown in the table below, the equipment purchased with Government funds, which is located throughout the university, constitutes a substantial portion of the university-owned equipment of certain units.

University-owned Equipment as of June 30, 1968

<u>Location</u>	<u>Total</u>	<u>Acquired with</u> <u>Government funds</u>	
		<u>Amount</u> <u>(note a)</u>	<u>Percent</u>
	(000 omitted)		
College of Literature, Science, and the Arts	\$ 9,501	\$ 3,967	42
" " Engineering	8,517	1,863	22
Medical School	9,458	5,357	57
School of Dentistry	1,345	585	44
" " Education	328	32	10
" " Natural Resources	553	98	18
College of Pharmacy	511	279	55
School of Public Health	1,661	1,128	68
Institute for Human Adjustment	251	46	18
Rackham Arthritis Research Unit	109	76	70
Institute of Industrial Health	253	57	23
Museums	3,186	36	1
Hospital--main group	5,348	132	2
Mental Health Research Institute	971	558	57
Institute of Science and Technology	1,374	680	49
Other units	<u>47,110</u>	<u>196</u>	-
Total	<u>\$90,476</u>	<u>\$15,090</u>	17

^aBased on allocations made by the university in its equipment use charge computation.

The various colleges, schools, departments, and research units on the Main and North Campuses and WRL have the use of about \$22.5 million worth of Government-owned equipment, in addition to the university-owned equipment. Approximately \$15.4 million worth of the Government-owned equipment is located at WRL, and most of the remaining \$7.1 million worth is located in various research laboratories on the North Campus. As shown in the following table, the defense agencies control most of the Government-owned equipment.

Government-owned Equipment
Located at the University
as of June 30, 1968

<u>Agency</u>	<u>Total</u>	<u>WRL</u>	<u>Campus</u>
	----- (000 omitted) -----		
Army	\$ 6,899	\$ 6,151	\$ 748
Air Force	6,578	5,384	1,194
DOD	3,805	3,805	
AEC	2,089		2,089
NASA	1,674		1,674
Navy	1,145	13	1,132
HEW	309		309
Other	<u>26</u>	<u>15</u>	<u>11</u>
Total	<u>\$22,525</u>	<u>\$15,368</u>	<u>\$7,157</u>

The university's Cyclotron Laboratory, located on the North Campus, illustrates the cooperation between the Federal and State governments and the university in providing research facilities. A cyclotron is a device used by nuclear physicists to study the nuclei (central parts) of atoms. The Cyclotron Laboratory is a departmental laboratory of the department of physics and is used for both teaching and research. As shown by the diagram on page 42 it houses two cyclotrons and related laboratory and office facilities. The building was financed by a special appropriation of \$1.1 million from the Michigan Legislature. AEC provided \$1.9 million to build an 83-inch cyclotron in the laboratory. This cyclotron, which is Government-owned, is shown on page 43. The university contributed "seed money"

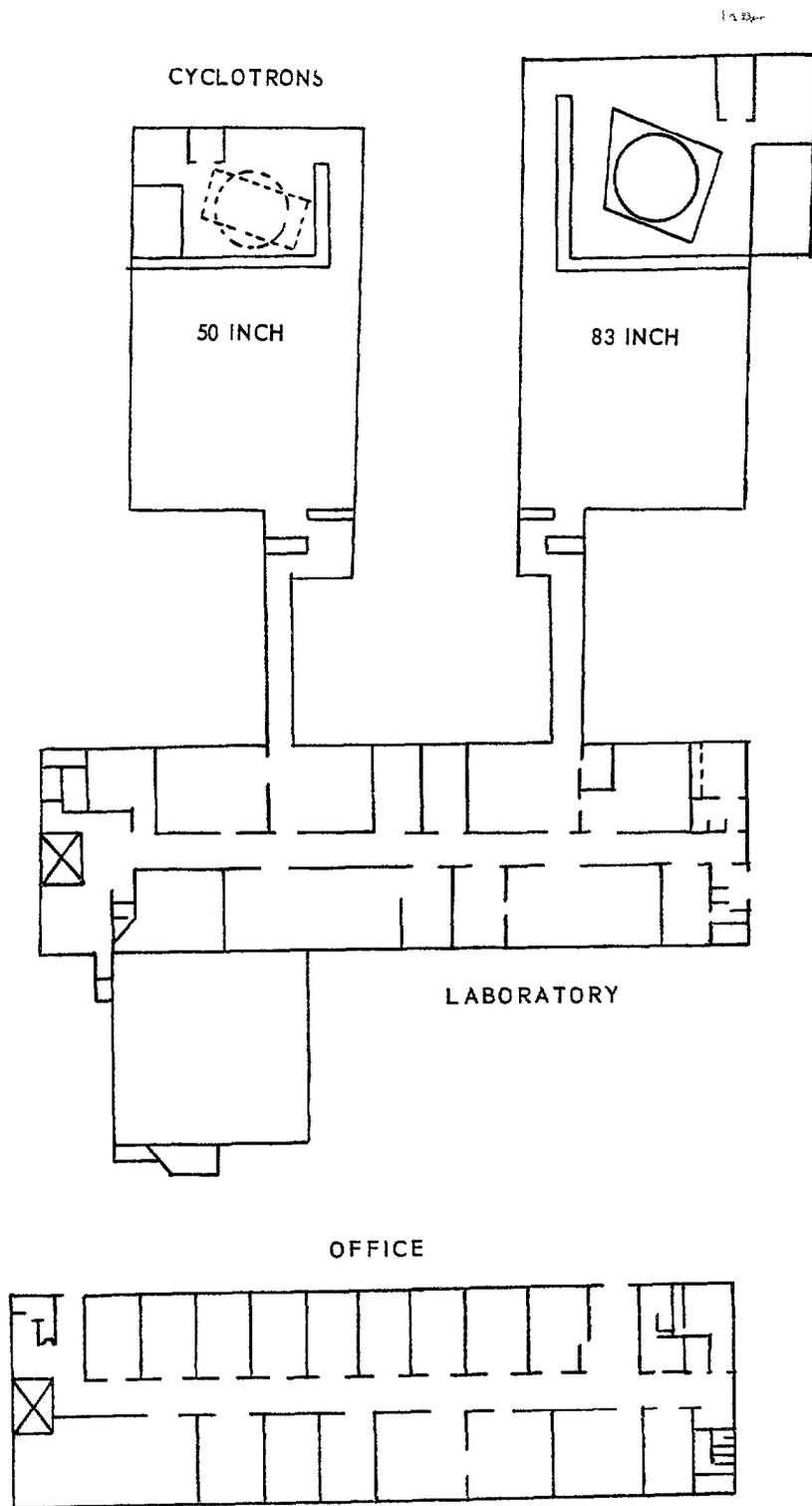
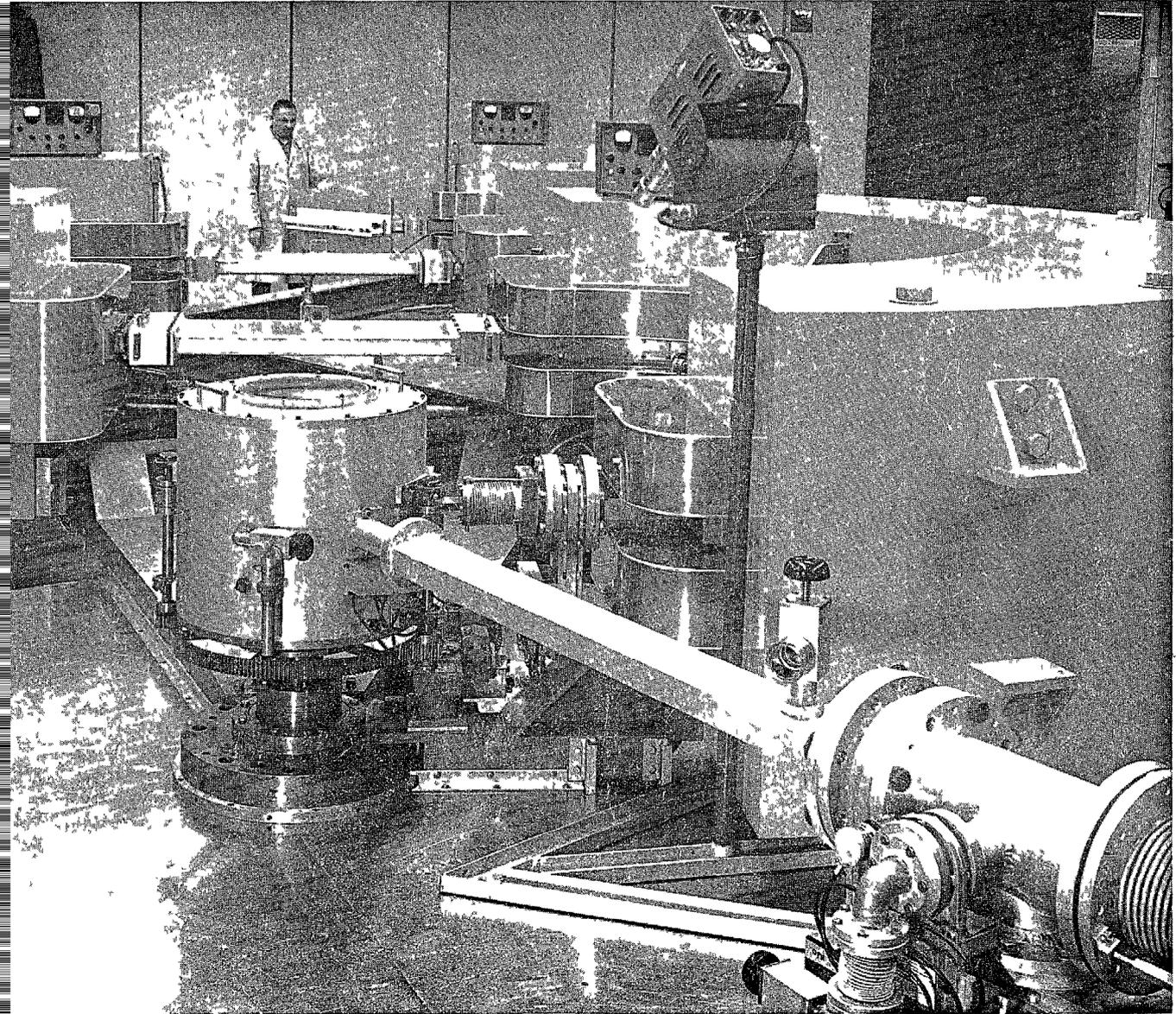


DIAGRAM OF CYCLOTRON LABORATORY



Government-owned 83-inch cyclotron located in the university's Cyclotron Laboratory on North Campus. This equipment weighs about 325 tons and cost about \$1.9 million.

for the initial stages of design contained in the proposal submitted to the AEC. An existing university-owned 50-inch cyclotron--originally built in 1936 with private foundation funds--was moved into the laboratory.

Procurement of equipment

University research proposals submitted to Federal agencies usually include a request for funds to purchase equipment necessary to carry out the research. In purchasing equipment for federally financed research projects, the university generally follows the same procedures it follows in procuring its own equipment.

The determination that additional equipment is needed for a research project is made by the individual researcher and his department head on the basis of a comparison of the equipment required under the project with the equipment already available in the department. The additional equipment needed is specifically identified in the project proposal submitted to the sponsoring Federal agency. Prior to approving proposals under defense cost-type contracts, the agency is required to screen lists of equipment available from the Defense Industrial Plant Equipment Center to determine whether existing Government-owned equipment could be transferred to the university.

The university's purchasing department is responsible for the actual procurement of the items at the lowest cost for the quality and service necessary. To ensure economical purchasing, the university requires competitive price quotations for items exceeding \$100 in cost. Prices on these items are usually obtained from a minimum of three sources by soliciting quotations.

Generally, equipment purchased with funds from Federal research grants becomes the property of the university. The Public Health Service (PHS) allows the university to take title to all equipment purchased with PHS grant funds. Equipment purchased under research contracts and costing less than \$1,000 can be given to the university upon completion of the contract. For example, the Armed Services Procurement Regulation provides for automatic transfer of title to such equipment to the university. Under research

contracts, the Government generally retains title to items costing over \$1,000 or to certain types of equipment classified as defense industrial plant equipment.

Government-owned equipment obtained for use on a particular research project is disposed of in ~~various~~^{several} ways upon the completion of the project. The Government agency involved issues instructions which may provide for transfer of the equipment to another institution or company doing Government research, to a Government storage area, or to another Government contract within the same university or the agency may donate the equipment to the university.

Control of equipment

Controls over Government-owned equipment are exercised by university property administrators located on the North Campus and at WRL. The Office of Naval Research monitors the equipment through its oncampus representative. In accordance with procedures approved by that Office, the university takes an annual physical inventory of Government-owned equipment.

At the end of each fiscal year, the university's property control office prepares a data processing listing of university-owned equipment for each department and forwards the listing to the department chairman. The listings show the description of each item, quantity, month and year of acquisition, serial or tag number, and location (building). The primary purpose of the listing is to provide the department with a control document that can be reconciled with a physical count of the equipment. Differences between the items reported on the listings and the physical inventory count are accounted for and reported to the property control office for adjustment of the central inventory records.

The property control section of the university's purchasing department maintains centralized inventory records of university-owned equipment by the department or unit that purchased or uses the item. Each department chairman or unit director is responsible for the physical control of equipment within his organization.

Several departments within the university, however, have not taken physical inventories of university-owned equipment. In a letter to the university dated November 4, 1968, the public accounting firm that audits the university's annual financial statements, discussed on page 113, stated that:

"It is our understanding that the Hospital's equipment has not been physically inventoried in several years. *** We recommend that regular periodic inventories of equipment be made."

The university's vice president and chief financial officer commented on the accounting firm's recommendation in a report submitted to the regents on November 15, 1968, as follows:

"Equipment has been inventoried in some of the major departments, though reconciliation entries have not been made. We concur that a complete physical inventory would be desirable, but it will involve added salary expense. Nonetheless, the recommendation will be studied further, in terms of cost and value of results."

The lack of physical inventories was not confined to the various departments within the university hospital complex. For example, inventories had not been taken in the department of zoology and in various departments in the Medical School. Although we did not inquire into this situation at all departments, we believe that it probably exists in other departments.

University officials advised us that equipment often was interchanged between departments and that this situation, coupled with the age of some of the equipment, would make a physical inventory almost impossible. They stated that a complete annual physical inventory would be too costly and that the results would not compensate for the time required to validate the inventory. The officials advised us, however, that the matter was under study and that they were working on a plan which would provide for the taking of cyclical physical inventories.

Conclusion

The equipment use charge, which is based on the value of university-owned equipment, represents a significant element of the university's total indirect cost that is paid by the Federal agencies. Therefore it is important that the inventory be accurately recorded. As shown on page 93, the equipment use charge represents 5 percent of the total indirect cost applicable to research. On the basis of the indirect cost of \$11 million charged to federally financed research, the equipment use charge in fiscal year 1968 amounted to about \$550,000.

In addition, we believe that the interchange of equipment between departments also shows a need for the taking of physical inventories. A physical count would afford assurance that equipment exists and appears to be in usable condition.

Our report to the Congress on a study of the feasibility of a uniform formula for indirect cost of research (B-117219, June 12, 1969) pointed out that the problems of inadequate inventory records and the lack of physical inventories appeared to be common at many universities. In this report we recommended that the Bureau of the Budget (BOB), in coordination with the concerned Federal agencies, consider requiring universities involved in federally financed research to maintain more reliable inventory records for equipment.

CHAPTER 6

UNIVERSITY RESEARCH PERSONNEL

Although significant amounts have been invested in constructing and equipping the physical facilities of the university to house and support instructional and research activities, the major operating cost is personnel compensation, including associated benefits. During fiscal year 1968, university salaries and wages amounted to about \$149 million, or about 68 percent of the university's total expenditures. During the same period, total salaries and wages under federally financed research projects amounted to about \$33.5 million, or 22 percent of the university's total personnel costs. The total research personnel cost constituted about 69 percent of the total project costs. The salaries and wages were applicable to the time or effort spent on the individual research projects by members of the professional and teaching staff, full- and part-time researchers, graduate and undergraduate students, service unit employees, and administrative and clerical employees.

NUMBER AND TYPES OF EMPLOYEES

During calendar year 1968, the university had about 21,400 full- and part-time employees. These employees consisted of about 4,300 (2,400 full-time and 1,900 part-time) members of the teaching staff, about 2,900 other academic employees, and about 14,200 nonacademic employees.

The university classifies its employees into two broad categories--academic and nonacademic. The academic category consists of the teaching faculty and professional research staff, including professors, assistant professors, instructors, research assistants, and research associates. Also included in the academic category are the university's principal administrative officers, librarians, curators, directors of teaching or research units, and other staff members with similar duties. The nonacademic category includes various administrative, professional, technical, clerical, skilled crafts, and service organization employees necessary to support the instruction and research activities of the university. Included in both categories are graduate

and undergraduate students who are employed as teaching fellows, research employees, student assistants, and administrative and clerical employees. In many instances, research provides the basis for the student theses required for graduate degrees.

The office of research administration reported that during fiscal year 1968 approximately 8,000 of the university's 21,400 employees were directly involved to some extent in sponsored research. The types of employees involved are shown in the table below. (For presentation purposes, students are shown separately.)

<u>Type of research employees</u>	<u>Number</u>
Academic employees:	
Teaching faculty	800
Research employees	<u>1,300</u>
Total academic employees	2,100
Nonacademic employees	2,400
Students:	
Graduate	2,000
Undergraduate	<u>1,500</u>
Total students	<u>3,500</u>
Total employees involved in research	<u>8,000</u>

According to officials of the office of research administration, their reported number of faculty members engaged in research does not include those faculty members whose salaries are used to meet the university's cost-sharing obligations (see p. 68) and consequently their salaries are not charged to the research projects. We were also advised by various faculty members that students having Government training grants worked on Government financed research projects but were not paid salaries from the projects. Thus the number of employees involved in research projects during fiscal year 1968 was greater than the 8,000 reported.

The teaching faculty members do research as an adjunct of their instructional activities. (For details as to the percent of time spent by the faculty in instructional and other activities, see p. 28.) The academic research employees generally do full-time research, although on occasion they may give lectures in the classroom and participate in other instructional activities. The nonacademic research employees are primarily involved in service activities related to research.

The hiring of employees, including those for research, is basically the responsibility of the various schools, colleges, departments, and other organizations of the university. All appointments, however, must be approved by either the academic or the nonacademic personnel office, as appropriate. The personnel offices are responsible for the formulation and administration of personnel policies and procedures for all university employees. The personnel offices also provide services for the university in recruitment, placement, salary and wage administration, and maintenance of personnel records.

Each university organization that hires full-time researchers generally seeks new academic and nonacademic employees for specific job openings rather than for general job classifications. Since research using various methodologies is done in many different fields, job qualifications can vary among organizations and among research projects within the same organization.

Officials of several instructional organizations indicated that, in hiring new faculty members, they generally sought individuals with experience or potential in both teaching and research. The philosophy of these organizations, which permeates the university, is that the faculty member, by performing research, can be a better teacher because research helps him keep abreast of developments in his field, makes him a more knowledgeable individual, and provides him with an opportunity to work closely with his graduate students.

PERSONNEL COMPENSATION

Personnel costs, consisting of salaries, wages, and fringe benefits, have historically exceeded 50 percent of the total sponsored research cost at the university. From fiscal year 1966 to fiscal year 1968, inclusive, the total costs charged to federally financed research projects were about \$135.6 million, of which about \$73.3 million, or 54 percent, were for direct salaries and wages of employees. As shown above, students constitute a significant portion of the total personnel engaged in research activities. During fiscal year 1968, students received almost \$5 million of the total \$26.5 million in direct salary and wage payments from research projects.

Individuals, including teaching faculty members, do not receive extra compensation for their research activities. Rather they are paid base salaries or wages, and the university is generally reimbursed for those portion of their efforts which are devoted to sponsored research, unless the individuals' salaries are used to satisfy the university's cost-sharing obligations. For example, if an individual having full-time departmental duties receives a research grant and plans to spend 50 percent of his time or effort on the research, his appointment will be changed to provide for one half of his salary to be charged to the research project, but his total salary will not be increased.

In fiscal year 1968, annual salaries for teaching faculty members ranged from about \$7,000 for an instructor to about \$36,000 for a full professor and annual salaries for researchers ranged from about \$5,400 to about \$30,000. The annual compensation for nonacademic research employees of the university ranged from \$4,400 to about \$17,200.

UNIVERSITY APPOINTMENTS

Teaching faculty members and researchers who receive academic appointments are employed on either a full-time or a part-time basis. The appointment form used by the university does not specify the number of hours a week or month that an individual will devote to the university. Rather the agreed-upon services are stated in terms of a

percent of the individual's effort, which can be 100 percent or less. The appointment form for a nonacademic employee shows the number of hours a week that the individual will work. All academic employees are on a salary basis, but nonacademic employees may be on either a salary basis or an hourly basis.

Although the university does not establish a specific number of hours of work for the teaching faculty, the faculty members are generally required to participate in all or various combinations of the following activities.

- Instructional activities--including teaching in the classroom or laboratory, preparing for classwork, and supervising student teaching and research.
- Administrative activities--including counseling students, serving on various university committees, and assisting student organizations.
- Scholarly activities--including participating in research and other creative activities.
- Professional activities--including participating in professional societies and civic groups and working as a consultant for organizations outside the university.

Generally the faculty member's department maintains records which indicate the extent of his involvement in each of the above types of activities. To gain an insight into the effects on the mix of the activities caused by an increase or decrease in the amount of research undertaken by individual faculty members, we reviewed available records for selected faculty members of one department within the College of Engineering for two fiscal periods. These records showed that the amount of effort devoted to sponsored research by individual faculty members varied from one fiscal period to the next. An increase in the individual's sponsored research effort was accompanied by a reduction in his classroom teaching or other activity; conversely, a reduction in the individual's sponsored research effort was accompanied by an increase in his classroom teaching or other activity.

TIME AND EFFORT REPORTING

The methods used by the university for charging salaries and wages to research projects vary according to the type of employee involved and, to some extent, the type of contractual instrument (contract or grant) used to finance the project.

Salaries and wages are charged to research contracts on the basis of (1) effort reports showing the estimated percent of total effort spent by each faculty member on the project and (2) time reports showing the number of days or hours spent on the project by nonfaculty employees, both academic and nonacademic. For research projects financed by grants, salaries and wages for nonacademic employees are charged in the same manner as under contracts, whereas salaries for all academic employees are charged on the basis of a predetermined percentage of the individuals' total salaries, which are set forth in their appointment forms. These percentages represent the amount of effort, estimated at the time the appointment forms are made out, to be devoted to particular research projects. Effort reports are subsequently prepared on a monthly basis by the academic staff to substantiate the charges made to grants.

Time reports

Time reports are prepared by academic nonfaculty research employees working on projects financed by contracts and by nonacademic employees working on projects financed by contracts or grants. The reports of salaried employees show the days or portions of days worked on each project, whereas the reports of employees paid on an hourly basis show the hours worked on each project. After they are approved by the appropriate project director, the reports are used as the basis for computing the amount of salaries and wages to be charged to each project. Time reports of nonacademic employees paid on an hourly basis are also used to determine the individuals' periodic wage payments.

Academic employees who have appointments split between research and other activities do not submit time reports for the portion of their time spent on the other activities.

Effort reports

Faculty members generally prepare monthly effort reports showing estimated percentages of their total effort spent on sponsored research, instruction, and other university activities. In those instances where faculty members do research under contracts, the effort reports are the basis used to distribute the appropriate share of their salaries to the research projects. For research financed by grants, the effort reports merely confirm the percentages of effort distribution in the individuals' academic appointment forms, which are used to distribute their salaries. The reports are reviewed and approved by the project director or departmental chairman, as appropriate.

Several university officials and faculty members advised us that no fixed basis existed for prorating effort among various activities or among research projects. They stated that faculty members did not always work a 40-hour week or a 5-day week. Rather the time worked each week might vary, and many faculty members occasionally worked up to 80 hours a week. Therefore the estimated proration of the individual's effort could only be made by the individual himself.

In June 1968, BOB, as a result of an interagency task force review of effort reports, revised its regulations which had previously required effort reports as substantiation of charges to grants and contracts. The revised regulations allow the universities to discontinue the use of effort reports for academic staff members performing research under projects financed by grants and contracts if the university's appointment and payroll distribution system is adequate to document direct salary charges. Since the university had been using its appointment and payroll distribution system for direct salary charges to grants and had used the effort reports merely to substantiate the initial charges, it has discontinued the use of effort reports for grants. Effort reports continue to be used by the university for contracts as the reports are the source documents for charging faculty salaries to research contracts.

CHAPTER 7

DEVELOPMENT OF RESEARCH PROJECTS

Before World War II research at educational institutions tended to be rather leisurely and content to follow the direction of individual intellectual interests, whereas today it is concerned more with immediate problems. The transition to the pragmatic approach was brought about, in part, by (1) the Government's mobilization of university facilities in the war effort of the 1940's, (2) the Government's subsequent continuing support of university research in order to develop the knowledge and trained men required by the Nation to maintain its role as a leader in science and technology, and (3) the awareness by Government and university scientists of the potential of research in the service of national goals.

During this transition, a more systematic and better directed approach to research, known as the project system, evolved. A key feature of the project system, which is a sort of task force operation, is the submission to a potential research sponsor of a written proposal containing a detailed consideration of the aims and methods of the proposed research, a time schedule, and a recognition of the relationship of the research to the interests of the sponsor and to other work in the field.

Research projects emanate from an idea, a desire, and a need. The need, as far as the Federal Government is concerned, may be general or specific. It appears that a large majority of research project proposals are unsolicited, originate outside the Government, and usually come from the university community. University officials have advised us that most proposals by the university are unsolicited. This is not surprising in view of the importance the university attaches to research. ?

According to university officials, research is indispensable to the advancement of knowledge and has an important role in the university's being able to fulfill its other functions of teaching and public service. It is the officials' position that new knowledge resulting from

research and integrated with existing knowledge invigorates and gives a timely quality to modern-day teaching. In addition, they have advised us that research and graduate-student instruction have become so intimately related that the latter cannot be carried on at quality level without the former. The officials have further advised us that faculty members are expected to engage in some research as a regular part of their scholarly activities and that an overwhelming majority do so.

Although most research proposals are unsolicited, the general stimulus in many cases may arise from the Federal agencies. Agencies are continuously advising the academic community of the research fields of interest to them, and scientists have access to public records that show the amount of research funds available to the agencies.

CREATION OF A RESEARCH IDEA OR OBJECTIVE

University researchers--teaching faculty and research employees--informed us that research ideas or objectives generally resulted from the researcher's continual review, analysis, and study in his field of interest. Such continuing efforts of the researcher are fostered by his curiosity and his desire to search out solutions to problems.

Part of this search includes attendance at and participation in scientific symposia, seminars, and conferences where the researcher is afforded the opportunity to discuss ideas with colleagues from other institutions and with agency representatives and to learn the results of recently completed research projects in his field of interest. The researcher also acquires knowledge disseminated through scholarly journals and technical publications.

Thus the researcher, through various modes of communication, absorbs as much knowledge as is available regarding his particular field of interest. From this knowledge, as well as his curiosity and imagination, he develops an idea or objective for a research project.

PRELIMINARIES TO
PREPARATION OF PROPOSALS

Once a research idea or objective has been established, the researcher must consider the resources, including outside financial support, available to him. The researcher who intends to submit a proposal for outside support will generally discuss his plans with his superior (e.g., department chairman) and obtain tentative approval for committing part of the unit's space, equipment, and other resources to the project. In many instances the researcher will contact Federal agency program representatives prior to preparation of a formal proposal to determine the agencies' tentative interest in the technical aspects of the proposal. These contacts may disclose that no agency is interested in supporting the project and thereby preclude preparation of a proposal. The contacts may also result in changes in the proposed methodology to more clearly meet the needs of an interested agency.

An agency may not express an interest in research in certain areas unless it knows that some results have already been obtained or that the feasibility of the research has been established. In such a case, the researcher may apply to the vice president for research for support of preliminary research. The funds for this purpose are considered seed money in that they are available to faculty members who need to do preliminary investigations upon which to base proposals for full-scale research projects that would interest outside agencies. In the distribution of these funds, special consideration is given to new faculty members who are seeking to establish themselves in sponsored research and to faculty members who are seeking support in new areas of research.

Preliminary research at the university amounted to about \$183,000 and \$271,000 during fiscal years 1967 and 1968, respectively. It is too early to know what outside support may result from these expenditures, but limited information for prior periods indicates that the return on investment is usually severalfold. For example, in the 3-year period ended June 30, 1964, preliminary research funds totaling about \$121,000 led eventually to grants and contracts totaling about \$2.8 million.

PROPOSAL PREPARATION AND REVIEW

Proposal preparation is generally the responsibility of the researcher. The completed proposal is reviewed by several management levels, including the researcher's department and the vice president for research.

~~The~~ Federal agencies have not prescribed the specific content and format of proposals. In accordance with agencies' suggestions, however, a proposal usually includes an abstract or brief statement of the objective; an introduction explaining the background of and need for the proposed research; a detailed description of the proposed research, including goals and methods; a statement about the space, facilities, and services that will be used; a list of the persons who will participate in the project, including biographical data on academic staff members; a time schedule; and a detailed budget showing the elements of cost, including costs for salaries, material, equipment, travel, reports, computer time, and any other anticipated needs. In addition, the proposal usually sets forth the source and amount of all outside-financed research projects under the supervision of each researcher scheduled to take part in the project.

University procedures require that four management levels review each proposal to ensure compliance with both sponsor and university policies. Where classified research is involved, a special committee within the university also reviews the proposal to ensure that the objectives of the proposed research are consistent with the objectives of the university. The four management levels that review the proposals and their review responsibilities are as follows:

Department chairman--Responsible for determining that the proposed project is appropriate to the department's aims and that staff and student commitments are in accordance with departmental programs and space availability.

Head of major unit (college or separate research unit)--Responsible for determining that the proposed project is appropriate to the unit's programs and that staff, student, and space requirements are in accordance with unit policy.

Project representative, office of research administration--Responsible for ensuring that university and sponsor policies have been complied with and that the proposal is complete, all approvals are in order, and any unusual requirements are met or brought to the attention of the vice president for research.

Vice president for research--Responsible for ensuring that the proposed project complies with university policy, structure, and plans.

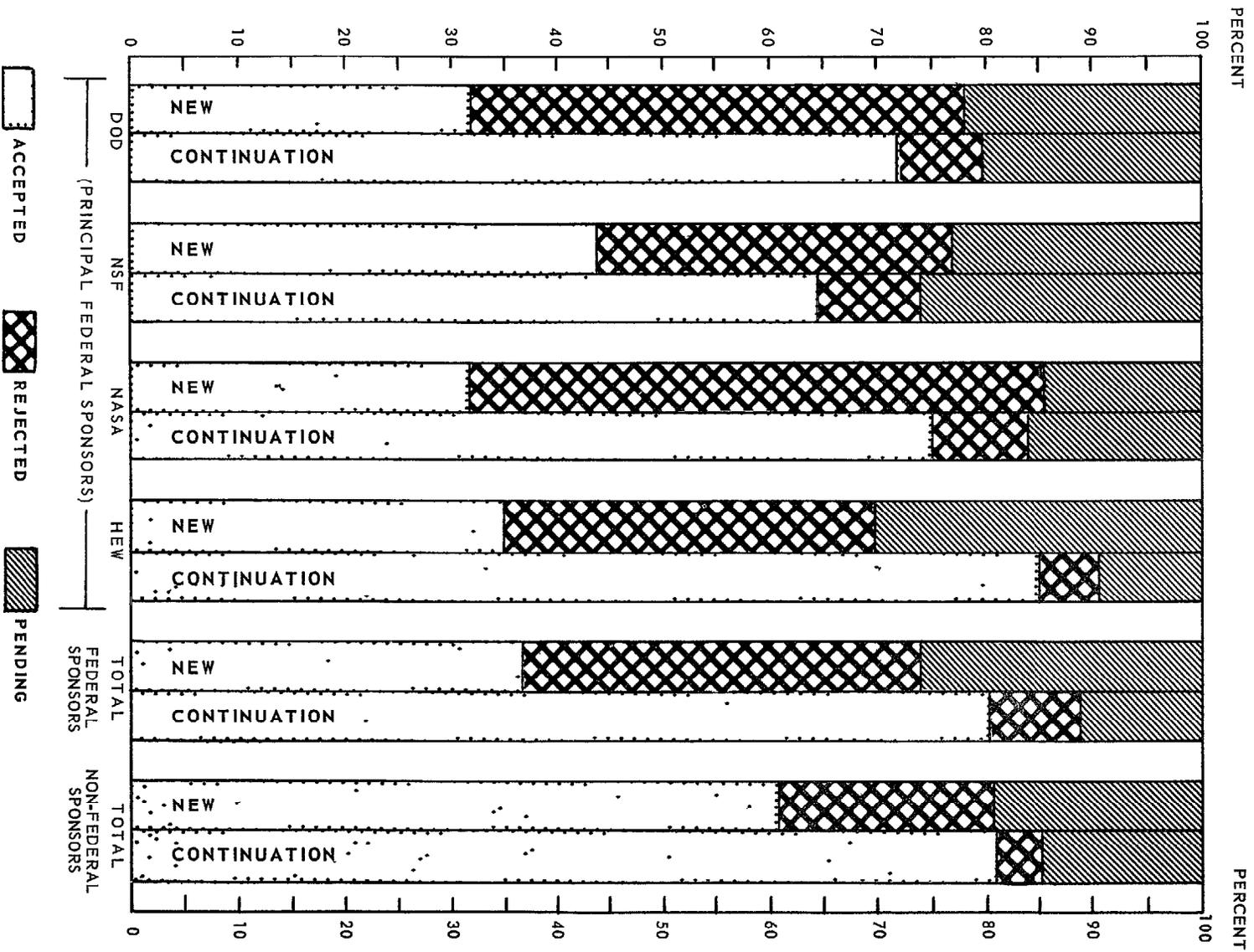
Departmental chairmen and faculty members advised us that very few proposals had been disapproved in the above reviews. They indicated that this situation was attributable to the researchers' having discussed their plans with their superiors and having receiving their tentative approval prior to submitting formal proposals, as discussed on page 57.

After the several reviews at the university, the proposals are submitted to the agencies. Many proposals are rejected. During fiscal years 1966-68, the university submitted about 2,800 research proposals to the various Federal agencies. As of December 1968, 1,600 of these proposals had been accepted by the agencies, 700 had been rejected, and 500 had not been acted upon.

Several factors are separately or collectively involved in an agency's rejection of a proposal. These factors include the scientific merit of the proposal, its merit in relation to other proposals, the agency allocation of funds among the fields of science, the geographical distribution of research support, and the total amount of funds available for research support.

The proposals submitted by the university are not only for new projects but also for continuation of existing projects. Agencies do not automatically fund continuation projects, as demonstrated by the fact that they rejected 7 percent of the proposals for such projects during fiscal years 1966-68. The percent of proposals accepted by agencies, however, is considerably higher for continuation projects than for new projects, as shown by the following graph.

PROPOSALS FOR NEW AND CONTINUATION PROJECTS
 SUBMITTED TO SPONSORS DURING FISCAL YEARS 1966-1968
 PERCENTAGE ACCEPTED, REJECTED, AND PENDING
 AS OF DECEMBER 31, 1968



The tables on the following page summarize, by sponsor, the university's proposals for new and continuation projects accepted, rejected, and pending for the 3 fiscal years 1966-68. Since many proposals are ultimately accepted over a year after being submitted, the number of proposals accepted for the most current period probably does not reflect the total proposals that will be accepted.

Status of Proposals Submitted to Sponsors for New Projects
During Fiscal Years 1966-68
as of December 31, 1968

Sponsor	1966			1967			1968		
	Number of proposals			Number of proposals			Number of proposals		
	Ac- cepted	Re- jected	Pend- ing	Ac- cepted	Re- jected	Pend- ing	Ac- cepted	Re- jected	Pend- ing
Department of De- fense	36	78	13	52	68	14	32	29	48
National Science Foundation	69	41	4	60	44	15	12	19	50
National Aeronau- tics and Space Administration	15	21	2	12	20	1	9	18	11
Department of Health, Education, and Welfare	94	60	9	63	72	21	23	46	106
Other agencies	<u>21</u>	<u>21</u>	<u>3</u>	<u>24</u>	<u>30</u>	<u>6</u>	<u>34</u>	<u>22</u>	<u>56</u>
Total to Fed- eral sponsors	235	221	31	211	234	57	110	134	271
Total to non- Federal spon- sors	<u>149</u>	<u>48</u>	<u>23</u>	<u>131</u>	<u>38</u>	<u>17</u>	<u>103</u>	<u>36</u>	<u>72</u>
Total	<u>384</u>	<u>269</u>	<u>54</u>	<u>342</u>	<u>272</u>	<u>74</u>	<u>213</u>	<u>170</u>	<u>343</u>

Status of Proposals Submitted to Sponsors for Continuation Projects
During Fiscal Years 1966-68
as of December 31, 1968

Sponsor	1966			1967			1968		
	Number of proposals			Number of proposals			Number of proposals		
	Ac- cepted	Re- jected	Pend- ing	Ac- cepted	Re- jected	Pend- ing	Ac- cepted	Re- jected	Pend- ing
Department of De- fense	72	5	7	73	10	10	41	6	29
National Science Foundation	27	3	3	21	3	5	10	3	14
National Aeronau- tics and Space Administration	21	-	3	27	3	1	29	5	12
Department of Health, Education, and Welfare	252	12	13	252	29	21	181	5	31
Other agencies	<u>22</u>	<u>3</u>	<u>1</u>	<u>23</u>	<u>1</u>	<u>2</u>	<u>22</u>	<u>1</u>	<u>12</u>
Total to Fed- eral sponsors	394	23	27	396	46	39	283	20	98
Total to non- Federal spon- sors	<u>81</u>	<u>5</u>	<u>7</u>	<u>86</u>	<u>7</u>	<u>17</u>	<u>66</u>	<u>-</u>	<u>17</u>
Total	<u>475</u>	<u>28</u>	<u>34</u>	<u>482</u>	<u>53</u>	<u>56</u>	<u>349</u>	<u>20</u>	<u>115</u>

CHAPTER 8

USE OF GRANTS AND CONTRACTS TO SUPPORT RESEARCH

Research projects at educational institutions are supported by the Federal agencies through the use of either grants or contracts. The choice of instrument to be used has an ultimate bearing on the cost of the research to the Government in that cost sharing has been a statutory requirement under grants but not under contracts. Government guidelines, however, have not been developed to provide the agencies with uniform criteria for determining when the grant or the contract instrument should be used.

Historically, the distinction between the contract and the grant instrument has centered on the purpose of the research project. If the Government's purpose was to procure research efforts in support of a particular need of its own, the contract was said to be the logical instrument to use. If, however, the Government's purpose was to aid or support research compatible with the university's educational function but likewise in support of a Government need, presumably the grant was the appropriate instrument.

Officials of several agencies and universities who have taken part in various Government studies have indicated that the distinction between the contract and the grant based on the purpose of the research now has little practical meaning, as both are being used to fund identical- or similar-type work. Thus a research project may be supported by either a grant or a contract, depending on which agency funds the project.

In fiscal year 1968, the university received from Federal agencies about twice as many research grants (625) as contracts (315). The total amount of the contracts, however, was about \$30 million, and the total amount of the grants was about \$28 million. Defense agencies awarded contracts almost exclusively. Nondefense agencies, on an overall basis, made use principally of grants but, on an individual basis, varied widely in choice of instrument. For example, NSF awarded grants almost exclusively, NASA awarded a fairly comparable number of both grants and

contracts, and AEC awarded contracts only. (As discussed on p. 72, AEC has obtained cost sharing by the university on most of its research contracts.) The number and amount of grants and contracts received by the university from Federal agencies during fiscal year 1968 are summarized in the following table.

Federal Research Grants and Contracts Received
Fiscal Year 1968

<u>Agency</u>	<u>Grants</u>		<u>Contracts</u>	
	<u>Num- ber</u>	<u>Amount (000 omitted)</u>	<u>Num- ber</u>	<u>Amount (000 omitted)</u>
Department of Defense:				
Air Force	8	\$ 280	76	\$ 5,093
Army	-	-	61	8,381
Navy	-	-	48	2,304
Other	-	-	8	1,521
Total--Department of Defense	<u>8</u>	<u>280</u>	<u>193</u>	<u>17,299</u>
Department of Health, Edu- cation, and Welfare				
National Science Foundation	461	20,165	49	5,175
National Aeronautics and Space Administration	113	5,790	1	780
Atomic Energy Commission	14	767	25	3,025
Other nondefense agencies	<u>29</u>	<u>575</u>	<u>23</u>	<u>709</u>
Total--nondefense agencies	<u>617</u>	<u>27,297</u>	<u>122</u>	<u>12,235</u>
Total--Federal agencies	<u>625</u>	<u>\$27,577</u>	<u>315</u>	<u>\$29,534</u>

We noted, in addition to the statutory requirements for cost sharing under grants, the following significant differences between selected research grants and contracts that had been awarded to the university by the major sponsoring agencies.

- In general, agencies require more frequent technical and financial reports for and make more frequent site visits to projects supported by contracts than for projects supported by grants. (See p. 104.)
- Under grants the university is funded by means of advance payments, but under contracts it often is funded after incurring the costs. (See p. 81.)
- Equipment purchased under research grants is usually given to the university, whereas equipment purchased under contracts is usually retained by the Government. (See p. 40.)
- Contracts have been subject to continuous audit by the Defense Contract Audit Agency (DCAA), but grants have been audited only upon request by the sponsoring agency. The audit function was transferred to the HEW Audit Agency on July 1, 1969, and HEW has informed us that audit coverage by the Audit Agency will include grants and contracts and also other types of Federal financial aid. (See p. 108.)

BOB, in a report issued in March 1966 entitled "The Administration of Government Supported Research at Universities," recognized the need for criteria in determining whether to use the grant or the contract. BOB recommended that agencies use the cost-reimbursement or fixed-price contract for research performed by universities in which a specific service or piece of hardware was the end product or when the Government found it necessary to exercise close control over the project. BOB recommended also that a standard instrument--a research agreement--be developed for use in circumstances not warranting a contract.

Officials of several universities were generally of the opinion that, if the Government would use a standard research agreement, there would be significant savings in administrative cost. Officials of Government agencies, however, expressed serious doubts that a standard research agreement could be devised which would offer any particular advantage over grants and contracts. One agency, which favored exploration of the possibility of such a standardized agreement, did not foresee development of an acceptable

agreement that could be used for both grants and contracts, since the objectives for each are usually somewhat different. DOD noted that each agency would have to carefully review any proposed agreement to ensure that its own individual requirements were provided for.

An official of BOB stated that, rather than having one instrument, a more important consideration might be the standardization of contracts and grants to achieve more consistency among agencies. HEW expressed the opinion that the establishment of uniform standards on the use of the grant and contract instrument for Government-wide application was a highly desirable alternative to a standard research agreement.

As a follow-up to the 1966 report, BOB initiated an interagency study in 1969 directed at determining the feasibility of (1) developing guidelines on when to use a grant and when to use a contract for university research and (2) developing a standard research agreement, as proposed in the 1966 report. The results were published in the "Report on the Project Concerning the Policies, Procedures, Terms and Conditions Used for Research Projects at Educational Institutions," dated June 20, 1969.

The report recommended that the Government not attempt to develop Government-wide guidelines as to when to use a grant and a contract and that no effort be undertaken to develop a standard research agreement. It recommended, instead, that an effort be made to achieve greater consistency in the policies and procedures for administration of research projects at universities, within the framework of current grant and contract instruments. The report proposed several measures to attain this objective, including the establishment of an interagency committee to have continuing responsibility for developing and maintaining Government-wide policies and procedures for the administration of such projects.

The report's recommendation against the development of a standard research agreement was based on several factors. One of the factors was that universities were more concerned with obtaining consistency among the agencies in regard to similar-type projects than with developing a new

instrument. The report's recommendation against the development of guidelines on when to use a grant and when to use a contract was based on the conclusion that it was not feasible to develop satisfactory guidelines and that there was no important need for such guidelines, except for the application of cost sharing. According to the report, the cost-sharing issue alone should not dictate that guidelines be imposed and should, in fact, be completely divorced from the grants-versus-contracts issue.

In response to its request for our comments on the subject report, we advised BOB in August 1969 that we were in general agreement with the procedures proposed in the report for the resolution of inconsistencies in practices of the various agencies. We pointed out, however, that our report to the Congress entitled "Study of Indirect Costs of Federally Sponsored Research Primarily by Educational Institutions" (B-117219, June 12, 1969), stated that, if Congress required cost sharing or other conditions to be applied to grants but not to contracts, there would be a need, on a Government-wide basis, for well-defined uniform standards for the use of such instruments. We noted in our comments that this would be necessary for consistent application of cost-sharing requirements or other distinctions and that we believed that it was feasible to provide such guidelines.

UNIVERSITY VIEWS ON GRANTS AND CONTRACTS

It is the view of the University of Michigan that there is presently little legal or practical distinction between the two forms of contractual instruments. In addition, the university claims that, to a considerable extent, the distinction between the kind of work supported and the amount of freedom granted in the technical aspect of the research work supported by the two instruments has largely disappeared. The university believes that, because of the great variety of requirements among Federal agencies supporting research at the university, it would be very worthwhile to increase the uniformity of the contractual and procedural approaches of the various agencies.

CHAPTER 9

COST SHARING IN FEDERALLY FINANCED RESEARCH

Apparently as a carry-over from early days of support from private foundations, early Federal support of research by universities restricted payments to direct costs incurred for research projects. Indirect costs were not paid because they were universally regarded as the institutions' contributions to the augmentation of knowledge by means of research and as evidence of the institutions' interest in the projects.

With the large increase in the volume of federally financed research during World War II, the Government recognized that the indirect costs had become a heavy burden to educational institutions, and since that time it has reimbursed the institutions for both direct and indirect costs associated with ~~such~~ research. Because research is of interest and benefit to both educational institutions and the Government, however, the Government has continued to require varying degrees of cost sharing by the institutions.

COST-SHARING REQUIREMENTS

Historically, the Congress had provided for cost sharing only on research done under grants. Although AEC, which uses the contract as the principal research instrument, has obtained some degree of contribution from recipients, cost sharing under contracts has not been required by law.

Prior to fiscal year 1966, cost sharing under Federal research grants was generally accomplished through limitations on the reimbursement for indirect costs. Agency appropriation acts for fiscal years 1963 through 1965 provided that a grant recipient not be paid an amount for research project indirect costs in excess of, generally, 20 percent of the total project direct costs. Thus the grant recipient was required to absorb all indirect costs, otherwise allocable to research projects, in excess of the specified percentage. These limitations often resulted in cost sharing, because, for most educational institutions, indirect costs applicable to research exceeded 20 percent of the direct costs.

For fiscal year 1966, the Congress revised requirements in agency appropriation acts to provide for mandatory cost sharing under research grants. In place of the previous limitation on reimbursement for indirect costs, the acts provided that any recipient of a grant for the conduct of a research project not be paid the entire cost of the project. BOB, in recognition of this new requirement, issued Circular No. A-74, dated December 13, 1965, which provided the agencies with implementing guidelines on cost sharing of research supported through Federal grants.

This provision was continued in the appropriation legislation for NASA, NSF, and HEW for the fiscal years 1967-69; and for DOD for fiscal years 1967-68. The appropriation acts for AEC for 1966-69 and for DOD for 1969 did not include any provisions for cost sharing.

The circumstances, manner, and extent to which educational institutions should share in or contribute to the cost of federally financed research continue to be matters of attention and divergent views. For example, in the fiscal year 1969 appropriation bill for DOD, the House of Representatives provided for continuance of the previous mandatory cost-sharing requirement, prohibiting Federal payment of the entire cost of a grant-supported research project, whereas the Senate substituted for this provision a requirement that the reimbursement of indirect research costs by DOD under both grants and contracts be limited to 25 percent of direct costs. The conference committee struck from the bill the language of both the House (cost sharing) and the Senate (25-percent limitation on indirect costs).

The conference committee stated that new and comprehensive studies should be made of the entire area by GAO, appropriate legislative committees, and the appropriation committees. The studies were to be directed toward achieving a uniform formula for ascertaining indirect costs on research grants throughout the entire Government. Our study of the matter has been issued as a report entitled "Study of Indirect Cost of Federally Sponsored Research Primarily by Educational Institutions" (B-117219, June 12, 1969).

Recent legislation on cost sharing

Appropriation legislation for fiscal year 1970 manifests a further divergence of views in the Congress on Government policy with respect to cost sharing in federally financed research.

Section 408 of the Independent Offices and Department of Housing and Urban Development Appropriation Act, 1970 (Public Law 91-126, approved November 26, 1969), which includes the appropriations for NASA and NSF, provides that:

"None of the funds provided in this Act may be used for payment, through grants or contracts, to recipients that do not share in the cost of conducting research resulting from proposals for projects not specifically solicited by the Government; Provided, That the extent of cost sharing by the recipient shall reflect the mutuality of interest of the grantee or contractor and the Government in the research."

Senate Report 91-521 by the Senate Appropriations Committee on the bill which became the above act stated that the new provision would permit the orderly evolution of administrative regulations to incorporate the new principles of cost sharing; that such regulations should be designed to establish equitable and uniform policies among governmental agencies insofar as practicable; that the kinds of costs shared, as well as the amount of cost sharing, should be a paramount factor in developing new regulations; and that in educational institutions cost sharing should generally be related to the amount of faculty salaries associated with the research projects.

The report also noted the belief of the Committee that the imposition of a statutory limit on reimbursement of indirect costs was not an equitable or effective mechanism for implementing a policy of cost sharing.

The Public Works for Water, Pollution Control, and Power Development and Atomic Energy Commission Appropriation Act, 1970 (Public Law 91-144, approved December 11, 1969), and the Department of Defense Appropriation Act, 1970 (Public Law 91-171, approved December 29, 1969), do not include any

provisions in respect of cost sharing in research by the)
agencies covered in these acts.

The Departments of Labor, and Health, Education, and Welfare, and Related Agencies Appropriation Act, 1970 (Public Law 91-204 approved March 5, 1970), contains the following provision in section 203, relative to cost sharing.

"None of the funds provided herein shall be used to pay any recipient of a grant for the conduct of a research project an amount equal to as much as the entire cost of such project."

EXTENT OF UNIVERSITY COST SHARING

BOB Circular No. A-74 prescribes that educational institutions receiving grants for research share in such research costs on more than a token basis but that the extent of their cost participation may vary in accordance with a number of factors relating to both the granting agency and institution. For example, the circular states that a higher degree of cost participation by the institution should ordinarily exist when the cost of the research consists primarily of the efforts of senior faculty during the academic year, or when the institution's long-range interests are best served by substantial cost participation. It further states that the cost participation should generally be lower when a major portion of the research cost consists of equipment; when the grant provides for a large component of services to be made available on a regional or national basis; or when, in the view of a Federal agency, an area of research requires special stimulus in the national interest.

We were unable to ascertain the extent to which the University of Michigan shared in the cost of all Federal research grants. Circular No. A-74 requires institutions to maintain records for each individual grant showing whether the agreed-upon cost sharing under the grant had been met, but it does not require a recording of the institution's total sharing under all grants. For 266 Federal grants received by the university in the period July 1967 through December 1968 for new research projects, the university agreed to contribute \$2.2 million, or 16 percent of

the total \$14.1 million budgeted cost of the projects. We believe that this provides some indication of the extent of the university's agreed-upon cost sharing. In addition, records we reviewed for a limited number of completed grants showed that the university's cost contribution equaled or exceeded its agreed-upon contribution.

The extent of the university's share in the cost of research projects varies among agencies and among projects of a given agency. For example, under 77 National Institutes of Health (NIH) grant projects completed during the period January 1968 to March 1969, the university's recorded cost contribution was about \$526,000, or 12 percent of the \$4.3 million total cost of the projects. Under 10 NSF projects completed in the same period, its contribution was about \$35,000, or 8 percent of the total cost. On an individual-grant basis, the university's contribution under the NIH grants ranged from \$100 to about \$57,000 and from 0.2 to 54 percent. Its contribution under the NSF grants ranged from \$1,200 to about \$9,300 and from 5 to 32 percent.

In addition to sharing the cost of research projects financed by Federal grants, the university shares in the cost of most research under contracts received from AEC. Although there has been no statutory requirement for cost sharing of research performed under contracts, Circular No. A-74 permits such sharing and it has been obtained by AEC which uses the contract as the principal research instrument. For example, the university agreed to share in the cost of 13 of the 20 AEC research contracts open in fiscal year 1968. Its agreed-upon contribution was about \$531,000, or 15 percent of the total \$3.5 million cost under the 13 contracts. By individual contract, the agreed-upon contribution ranged from \$1,800 to \$196,000 and from 7 to 55 percent.

DIFFERENCES IN AGENCY POLICIES
AND PROCEDURES ON COST SHARING

Although BOB Circular No. A-74 established the general guidelines for cost sharing, the manner in which the circular was to be implemented was left to the respective agencies. The cost-sharing policies and procedures of the three agencies from which the university has received most of its research grants--HEW, NSF, and NASA--permit educational institutions to satisfy cost-sharing requirements for research projects by contributing to any or all elements of the costs of the projects. Differences exist, however, among the agencies as to the basis for negotiation of the cost-sharing agreement and as to the expected level of cost sharing.

Regarding the basis of negotiation of the cost-sharing agreement, NASA and NSF policies requires educational institutions to negotiate on an individual-grant basis. In contrast, HEW policy permits educational institutions to negotiate cost sharing on either an individual grant basis or an institutional basis. The majority of the university's HEW research grants are from Public Health Service and for these grants the university has elected to cost share on the institutional basis. Under the present institutional agreement negotiated with PHS, effective July 1, 1967, the university is required to contribute a minimum amount of \$100 on each grant but otherwise may contribute any percentage of cost it deems appropriate provided that the total contribution under all grants is not less than 6 percent.

University officials advised us that negotiation of cost sharing on an institutional basis was more satisfactory than negotiation on a grant-by-grant basis. They said that the latter basis, involving a separate negotiation for each grant, was time-consuming and costly to the university. It was their view that Circular No. A-74 should be modified to encourage agencies to develop institutional arrangements similar to those of PHS.

As criteria for the level of university cost sharing of research financed by grants, HEW guidelines for institutional cost sharing specify past experience, NSF guidelines specify NSF support of faculty salaries, and NASA policy

specifies the merits of the research and the institution's situation.

In March 1967 HEW, shortly after permitting use of institutional cost-sharing agreements, issued implementing guidelines which require some contribution on each grant. The guidelines permit this contribution to be token provided that the average contribution on all grants is more than token and provided that the institution's cost contribution generally be expected to approximate the level of cost sharing in the preceding 2 years.

We were informed by a university official that the 6-percent cost contribution required under the previously cited institutional agreement with PHS had not been based on a study of the university's level of cost sharing in the preceding 2 years. The official told us 6 percent was the rate the university had envisioned that PHS would accept. Our review of 77 NIH grants (PHS includes NIH) completed during the period January 1968 to March 1969 showed that the university actually had contributed 12 percent of the total cost of the projects involved. According to PHS officials, the rates negotiated with other educational institutions ranged from about 5 to 40 percent of total cost of the projects.

NSF guidelines provide that the cost-sharing requirement for an individual research grant will generally be satisfied if the institution contributes an amount that at least matches the NSF support of faculty salaries, including applicable indirect costs, under the project. The guidelines further specify that such a contribution must constitute more than a token participation. For 67 NSF grants received by the university during the period July 1967 through December 1968, the university's agreed-upon cost contribution ranged from 3 to 56 percent of the anticipated project cost, depending on the amount of faculty participation. For six of the 10 NSF grants completed during the period January 1968 to March 1969, the university's cost contribution exceeded by from 2 to 49 percent the agreed-upon contribution.

NASA policy provides that institutions show the manner and amount of their cost participation in each research

proposal and that NASA, during the negotiation process, re-view the adequacy of the cost sharing "in the light of the merits of proposed research effort and the varying institutional situations." NASA believes that the policy should preclude institutions' becoming financially burdened by the arbitrary imposition of rigid cost-sharing factors. Our re-view of six NASA grants received by the university during the period July 1967 through December 1968 showed that the university's agreed-upon cost contribution ranged from about 3 to 5 percent of the anticipated project cost.

University officials believe that wide variations in cost sharing among agencies and among grants of a given agency are due to the agencies' inconsistency in applying what the officials term the loosely stated requirements of BOB guidelines. They advised us it would be helpful if Circular No. A-74 were revised to more clearly enunciate the extent to which an institution may be expected to share in the cost of research.

UNIVERSITY VIEWS ON COST SHARING

The Congress has manifested its concern about cost sharing in appropriation legislation, as already noted, and in various studies of university research in recent years. University officials also are concerned about cost sharing. They have informed us that the university is generally willing to bear some part of the financial support of its re-search activities. They believe, however, that mandatory cost-sharing requirements are inappropriate and inequitable to colleges and universities and have had a substantial ad-verse effect on university educational and research objec-tives.

The university officials contend that Federal agencies utilize universities' capabilities, developed and nurtured over decades, to do research which could not be duplicated elsewhere and that the University of Michigan has created or expanded certain disciplines in response to Federal pro-grams. It is their position that mandatory cost sharing of Federal research has drained university funds from other uses, including independent research and educational pro-grams, and has created imbalances in the universities' pro-grams.

AGENCY VIEWS ON COST SHARING

The attitudes of Federal agencies toward cost sharing were summarized in our report entitled "Study of Indirect Cost of Federally Sponsored Research Primarily by Educational Institutions" (B-117219, June 12, 1969). To round out the discussion of cost sharing for the purpose of this report and to serve the convenience of the readers of this report, we are citing below the full text of the summary of agency views as it appeared in the June 12, 1969, report.

"Generally, Government agencies believe that the greater the degree of research orientation to the agency mission the lesser the justification for mandatory cost sharing. BOB officials believe likewise that the degree of cost sharing should vary according to the range of Government interest in the project. For example, the degree of national interest may be larger in those agencies where research is program-oriented than where there is more general research such as that performed under NSF grants.

"NASA believes that it is highly desirable that it be able, at its discretion, to provide full reimbursement for the cost of research performed for NASA. According to NASA, research projects are accepted only if there is definite evidence that the project will contribute to NASA program objectives to the extent fully commensurate with the cost.

"DOD informed us that, under its present guidelines, it selects only those proposals in which it has a definite interest, and believes there should be no mandatory requirement for cost sharing.

"AEC believes that the main effect of cost sharing is the obtaining of a larger mission-oriented research effort but that mandatory cost sharing should not apply to research supported by 'mission' agencies. In AEC's opinion a rigid requirement for cost sharing under all conditions would probably lead to a lower level of quality

of the total research effort for mission-oriented programs; most importantly, agencies would not be able to accept attractive, high-quality proposals that do not contemplate cost sharing.

"NSF feels that whether the recipients of research awards should be required to share in the cost of the project should depend on whether the Government is buying a product or supporting an activity where both parties have an interest. In any case NSF believes that cost sharing should not be a requirement by law but, instead, a matter of agreement between the parties concerned in the transaction.

"HEW states that its experience suggests that the statutory requirement for cost sharing has produced few, if any, discernible benefits; however, HEW believes that cost sharing is inherent in the grant relationship.

"The agencies believe that, if mandatory cost sharing is continued, the manner of implementation and administration should continue to be flexible in order to enable agencies to consider cost-sharing proposals on a case-by-case basis. BOB officials stated that the degree of cost sharing should vary, in part, in accordance with the nature of the institution and its ability to contribute."

CONCLUSIONS

The extent of the university's share in the cost of research projects supported by Federal grants has varied among the agencies involved and among grants of a given agency. Evidently the university's cost contributions under the projects have equaled or exceeded its agreed-upon contributions. In addition, although there has been no statutory requirements for cost sharing of research performed under contracts, the university has shared in the cost of most research projects performed under AEC contracts.

BS
Our conclusions on the general matter of cost sharing are set forth in the aforementioned report of June 12, 1969. As stated in that report, we concur in the concept adopted in 1966--that cost sharing, to the extent that such is required, should be related to the total cost of the project--contrasted with the concept that cost sharing should be made mandatory by setting a limitation on the indirect-cost rate.

As further stated in that report, we believe that consideration of the interests of the Government and educational institutions makes it highly desirable that, within the requirements established by the Congress or the executive branch, the amount of cost sharing should be flexible--a matter for negotiation between the responsible Government agency and the grantee institution. Negotiations should include consideration of such factors as the degree of university interest in research, the nature of the costs to be incurred, the effect of the work on the financial condition of the institution, and the desirability of using a particular institution for a specific project and of such other policy or program aspects as may be pertinent to the research involved.

Also, as discussed beginning on page 63, variations in Government agency practices have tended to blur the distinction between contracts and grants and the use of contracts or grants does not provide a clear or consistent line of demarcation between the various types of research which would be meaningful for cost-sharing purposes. Accordingly, we believe that additional criteria and guidance to the

agencies to assist them in following more consistent and uniform practices are both feasible and desirable.

It appears to us that, if a consistent policy is to be followed by the various agencies concerned, there will be a need for guidance from the Congress or the executive branch on whether cost sharing is to be required and, if so, the general level and the kinds of research programs in which it will be expected, as well as the degree of latitude to be permitted in its administration.

Legislation enacted by the Ninety-first Congress sets out three different statutory policies governing cost sharing in federally financed research and augments the postulate implicit in prior legislation that the extent of cost sharing be determined according to the Federal agency for which the research is being done. In our view this postulate is in direct conflict with the concept of consistent policy noted in the preceding paragraph and contemplated in Senate Report 91-521 previously cited.

Although the Federal agencies presumably are free to promulgate regulations requiring cost sharing beyond what is provided for in recent legislation, experience has shown, as heretofore discussed, that agency policies and procedures have differed among the agencies, and in the light of the recent legislation there is no reason to expect that such differences will be resolved into consistent and uniform policies. Moreover the existence of different statutory standards for cost sharing lays the groundwork for controversy with agency regulations which go beyond these standards.

The impact of these different standards will be felt most by those organizations which do research for several agencies whose appropriations are included in two or more of the appropriation acts for 1970 heretofore cited. Such organizations include particularly educational institutions, such as the University of Michigan which conducts research under grants and contracts for most, if not all, the major Federal ~~research~~ agencies. In addition to the above problems, the implementation of three different policies and related agency regulations will undoubtedly add to the

administrative burden of the educational institutions as well as other organizations similarly situated.

In summary we believe that the aforesated postulate is basically unsound and compounds the difficulty of achieving a consistent policy among the Federal agencies in regard to cost sharing in federally financed research.

MATTER FOR CONSIDERATION BY THE CONGRESS

In consideration of the foregoing observations, we recommend that the Congress consider legislation to prescribe a consistent Government policy for cost sharing in federally financed research for all Federal agencies.

The new principle of cost sharing enunciated in Public Law 91-126 under which cost sharing is required on all grants and contracts for research by the agencies specified in that law, except where the research is specifically solicited by the Government, may present some problems, such as whether a proposed research project which has been modified to meet a sponsoring agency's purposes should be considered as having been solicited by the Government or as having been proposed by the grantee or contractor. This principle, however, has the advantage of neutralizing the issue of grants versus contracts and of possibly broadening the base of cost sharing and thus seems preferable to the related provisions in Public Law 91-204 which applies only to grants. The provisions in both acts allow the Federal agencies to negotiate the extent, nature, and other conditions of cost sharing.

RESPONSE BY AGENCIES

BOB specifically endorsed this recommendation; none of the other Federal agencies opposed it. BOB stated that it was revising Circular No. A-74 (see p. 71) with the objective of establishing consistent and equitable cost-sharing policies and practices among all Federal agencies and that such revision would obviate the need for additional cost-sharing legislation except that necessary to remove the current inconsistent statutory requirements.

CHAPTER 10

METHODS OF FUNDING RESEARCH PROJECTS

Federal agencies use two general methods to fund the university for costs incurred on research projects--advance payments and reimbursement of costs. To provide advance payments, civil agencies that finance a substantial volume of research use letters of credit, whereas the defense agencies use special bank accounts in local banks or periodic predetermined payments. Reimbursement of costs is the traditional method of funding projects under cost-type contracts. The university uses its own funds to finance such contracts, pending reimbursement by the individual agencies.

The method by which the university receives payment for research supported by Federal agencies appears to be primarily dependent upon the type of contractual instrument used and the particular agency involved. The following table shows the funding methods used under contracts and grants at the university by the principal research-sponsoring agencies in fiscal year 1968.

Agency Methods of Funding Contracts and Grants Fiscal Year 1968

<u>Agency</u>	<u>Cost-type contracts</u>	<u>Fixed-price contracts</u>	<u>Grants</u>
Army	Cost reimbursement and advance payment	Advance payment	Advance payment
Navy	do.	do.	(a)
Air Force	Advance payment	(a)	Advance payment
HEW	Cost reimbursement	Advance payment	Do.
NSF	(a)	(a)	Do.
NASA	Cost reimbursement	(a)	Do.
AEC	do.	Advance payment	(a)

^aNot applicable

ADVANCE PAYMENTS

HEW, NSF, and NASA use the letter of credit to provide the university with advance payments for costs to be incurred on grants; AEC and HEW use the letter of credit to provide the university with advance payments on their fixed-price contracts. During fiscal year 1968, the Army, Navy, and Air Force maintained accounts in a local bank for use by the university in obtaining advance payments for designated cost-type contracts. Withdrawal of funds by the university under either of these advance-payment methods is predicated upon anticipated costs to be incurred within a specific time frame. In addition, certain agencies make use of predetermined advance-payment schedules. These agencies include the defense agencies under fixed-price contracts, the Army under grants, and various other Federal agencies that support a small volume of research at the university.

Letters of credit

It has been the established Government policy to avoid premature advances of funds and thereby preclude unnecessary borrowings and related interest costs. Treasury Department Circular 1075, revised, provides that cash advances be timed in accord with the actual cash requirements of the recipient in carrying out the purpose of the program or project. The letter-of-credit method of financing was established to achieve the foregoing objective. Letters of credit permit the recipients to draw funds through Federal Reserve banks as needed for program requirements and thereby avoid premature withdrawals from the U.S. Treasury.

HEW and NSF have established letters of credit that allow the university to draw monthly up to about \$2.3 million and \$429,000, respectively. These letters of credit are used to advance funds not only for research projects but also for other programs, such as training grants and fellowships. The NASA letter of credit is adjusted upward quarterly by the amount necessary to provide the university with funds to cover estimated costs under grants for the next quarter. The AEC letter of credit is established for an amount equal to 90 percent of the cumulative price of all AEC fixed-price contracts; the remaining 10 percent under

each contract is funded upon completion of the contract. During fiscal year 1968 there were no other Federal agencies using the letter of credit to advance funds to the university.

Funds are drawn by the university on the Detroit Branch of the Federal Reserve Bank of Chicago through a local bank. The amounts of funds periodically drawn under the letters of credit are determined by the university within the prescribed dollar limitations set forth in the letters. The amounts drawn under the HEW and NSF letters of credit are based on the anticipated monthly costs determined through an analysis of the volume of expenditures in recent months; the seasonal fluctuations, trends, and cycles of expenses in prior years; and the balance of funds remaining at the end of the preceding month. Under the NASA and AEC letters of credit, the university draws funds based on its estimated expenses for the subsequent quarter or month. The university submits to all four agencies quarterly reports showing the total funds withdrawn; expenses incurred on an individual grant or contract basis; and the remaining balance, if any.

The amount of funds drawn under the letters of credit during fiscal year 1968 amounted to about \$31.9 million, or about 47 percent of the \$68.4 million in total Federal support to the university. We estimate that, of the \$31.9 million, about \$21.8 million was withdrawn for research projects, as summarized in the following table.

<u>Agency</u>	<u>Amount withdrawn</u>	
	<u>Total</u>	<u>Research (estimated)</u>
	————(millions)————	
HEW	\$25.4	\$15.8
NSF	5.3	4.8
NASA	0.9	0.9
AEC	<u>0.3</u>	<u>0.3</u>
Total	<u>\$31.9</u>	<u>\$21.8</u>

Twice a month during 1966 and 1967 the university was drawing about half of the amounts available under the HEW and NSF letters of credit, although the rate of expenditures in the first half of each month was less than in the second half. Subsequent to our discussions of the matter with university officials, the drawings during the first half of each month were brought more in line with the rate of expenditures.

Special accounts

The Armed Services Procurement Regulation, appendix E, allows advance payments on nonprofit contracts with nonprofit educational institutions for experimental or research and development work. The regulation provides that such payments be used sparingly and that advances outstanding not exceed actual reasonable requirements for the contracts. According to the regulation, the amount of an advance payment should be based upon an analysis of the cash flow required under the contract(s) and, as a general rule, should not exceed the interim cash needs arising during the reimbursement cycle.

The Departments of the Navy and Air Force have negotiated advance-payment agreements with the university whereby the agencies have deposited \$300,000 and \$1,000,000, respectively, in special bank accounts in a local bank for university use in meeting current expenses on designated cost-type contracts. The amount of funds deposited in each account is intended to defray about 2 months' expenditures under the designated contracts. Prior to February 1968 the Army also maintained a similar special account in the amount of \$500,000. This account was discontinued because the volume of expenditures under the contract to which the advance pertained had been substantially reduced.

The university withdraws monthly an amount from each account that is equal to one half of the established amount adjusted for the difference between the amount drawn 2 months previously and the actual cost during that month. At the time of withdrawal, the university submits to the appropriate agency a report which includes a certification that the charges to be paid with the advanced funds are reimbursable, the basis for the amount withdrawn, and the

bank account balance before and after withdrawal. At the end of the month, the university submits to each agency a report showing the beginning and ending monthly balances, activity during the month, and cumulative activity since establishment of the accounts.

After the end of the month, the university bills the appropriate agency for costs incurred under the designated contracts, in the same manner as for any other cost-reimbursement contract. (See p. 86.) The agencies replenish the special bank accounts by depositing in them the amounts of the billings.

During fiscal year 1968 the university withdrew about \$10.1 million from these accounts to finance research costs, as summarized below.

<u>Agency</u>	<u>Amount withdrawn</u> <u>(millions)</u>
Army	\$ 1.9
Navy	1.6
Air Force	<u>6.6</u>
Total	<u>\$10.1</u>

Predetermined payments

Fixed-price contracts awarded by defense agencies and Army grants provide for quarterly advance payments to the university on the basis of predetermined payment schedules. Some fixed-price contracts provide for automatic payments by the agencies on specific dates, whereas others require the university to request the funds from the agencies before the advance payments are made. Detailed supporting documentations are not required for requests submitted by the university on fixed-price contracts. Grants of various other Federal agencies that do not support significant volumes of research at the university also provide for periodic advance payments based on predetermined payment schedules.

We estimate that during fiscal year 1968 the university received about \$3.2 million under this method of funding.

REIMBURSEMENT OF COSTS

With the exception of those designated contracts included under the advance-payment agreements, as discussed on page 82, cost-type contracts provide for the reimbursement of costs, i.e., payment to the university after it has incurred the costs. We estimate that during fiscal year 1968 the university incurred costs of about \$13.8 million for which it later received reimbursement.

About 25 days after the end of the month in which the costs are incurred, the university prepares a monthly payment voucher for each research contract and forwards the voucher to the appropriate agency through the resident staff of the Defense Contract Audit Agency. The voucher is accompanied by a cumulative billing statement showing the monthly and cumulative costs incurred and a detailed statement showing the costs incurred during the preceding month.

To prepare the payment voucher, the university uses different automatic data processing runs that show, in addition to the information attached to the voucher, the amount of costs incurred but not billed for each contract, contract termination date, and the balance of funds remaining on each contract. The purpose of this information is to guard against submission of a voucher for (1) an amount in excess of costs incurred, (2) an amount in excess of the contract price, and (3) a cost incurred after the termination date of the contract.

The payment vouchers are reviewed and provisionally approved, subject to final audit, by DCAA which then submits them to the appropriate agencies for payment. Reimbursements are made directly to the university, generally about 2 months after the costs are paid.

UNIVERSITY CASH POSITION ON FEDERAL PROJECTS

The university maintains a separate fund to account for all Federal funds received and withdrawals made for Federal projects. A monthly reconciliation of this fund for the 6 months ended December 31, 1968, showed that, on the average, the university used about \$3.6 million monthly of

its own funds to cover costs incurred under federally financed research projects. This use of university funds was due primarily to the time required to prepare and process payment vouchers under cost-reimbursement contracts. At the end of its normal reimbursement cycle, the university receives reimbursement for the funds it advanced during the previous period.

UNIVERSITY COMMENTS ON FUNDING

University officials informed us that, as the university was allowed neither a fee on contracts and grants nor recovery of interest lost on university funds used to finance Government cost-type contracts, the agencies should provide the university with sufficient advance payments to cover all costs on research projects.

The view of the National Association of College and University Business Officers is that interest paid by a university or income sacrificed by the expenditure of funds which might otherwise have been invested represent just as real a cost to a university as does the interest paid by the Government on its borrowings represents a cost to the Government. The association therefore believes that the allowability of interest as a cost in sponsored research grants and contracts with universities is both logical and equitable. The association, in coordination with the American Council on Education, has requested BOB to amend Government cost principles to allow universities to recover such interest costs.

BOB has drafted a revision of the interest provision which, if finalized, will allow interest expense incurred by a university on funds borrowed to purchase certain types of equipment in situations where an agency's budget does not permit financing such purchase and the equipment is considered by the agency as essential to the related project.

CONCLUSION

We did not specifically determine whether the university was incurring interest cost or sacrificing interest income through the financing of about \$3.6 million monthly of costs under cost-type contracts. Since the university

does not receive a fee, profit, or interest, the use of its own funds to finance Federal research is, in effect, additional cost sharing.

RECOMMENDATION

As the unallowability of interest cost is a Government cost principle applicable to many contracts other than those awarded to universities, we believe that solution of this problem does not lie in the repeal or substantial alteration of the cost principle governing interest costs. Rather, we recommend that the Director, Office of Management and Budget, in collaboration with other concerned Federal agencies, study the feasibility of adopting a uniform system of providing universities with sufficient advance funds for programs financed by all agencies. Such a system should be designed with an aim toward reducing the administrative burdens of the universities and the agencies in handling payments.

RESPONSE BY AGENCIES

Except for AEC which did not express its views, all the agencies concurred in the objective of this recommendation. BOB advised us that it was giving specific attention to policies and procedures for providing advance funds in a new circular, now in draft form, on certain aspects of the administration of research projects. BOB also noted that this matter would be considered in the interagency study of standardizing administrative requirements of grant-in-aid programs under the President's Federal Assistance Review program. HEW stated that advance funding through the letter of credit or similar mechanism should do much to alleviate the funding problem of the universities and that it was working with the University of Michigan to streamline the HEW letter-of-credit procedures.

CHAPTER 11

ACCOUNTING FOR COSTS OF RESEARCH

The accounts of the university are classified into nine separate funds to segregate monies on the basis of their source and the use to be made of them. Each of the nine funds is a separate accounting entity used to control the assets, liabilities, revenues, expenditures, receipts, disbursements, and remaining balance of the fund. The general accounts for these funds and the subsidiary project cost accounts are maintained and periodic reports to sponsor agencies are made on a cash basis. For purposes of the university's annual published financial report, the general accounts--principally payrolls and purchases--but not the project cost accounts are converted at year-end to an accrual basis, except for gifts, grants, investments income, and interest on indebtedness.

The university's accounting system provides for the accumulation of reimbursable research costs in separate accounts for each research project. The university's share of costs for those projects which require cost sharing, however, is generally recorded separately, by project, outside the accounting system. Therefore references in this chapter to project costs apply only to those costs which are reimbursable by the Government.

Upon receipt of a contract or grant award from a Federal agency, the university's accounting office assigns an account number to the research project involved. The account number is used to identify all transactions specifically related to the project, e.g., personnel appointments and purchase orders. Subsequent to the end of each month, the accounting office provides the researcher in charge of the project with a financial status report showing the total approved budget for the project, expenditures in the preceding month, total expenditures to date, encumbrances, and unencumbered balance by cost category.

The cost of research comprises the direct costs incident to its performance plus the allocable portion of indirect (overhead) costs of the university. Direct costs are

those costs identified as having been specifically incurred in the performance of research. Indirect costs are those costs which are incurred for common or joint purposes of research, instruction, and other activities and which should be distributed in reasonable and equitable proportions in terms of their relative contribution to these activities. The total direct and indirect costs charged by the university to federally financed research projects during fiscal years 1966-68 are summarized below.

<u>Type of costs</u>	<u>Amount</u>			<u>Average percent</u>
	<u>1966</u>	<u>1967</u>	<u>1968</u>	
	(000,000 omitted)			
Direct costs:				
Salaries and wages	\$23	\$24	\$26	54
Equipment	2	3	2	5
Travel	1	1	1	2
Supplies and other direct costs	<u>7</u>	<u>9</u>	<u>8</u>	<u>18</u>
Total direct costs	33	37	37	79
Indirect costs	<u>8</u>	<u>9</u>	<u>11</u>	<u>21</u>
Total costs	<u>\$41</u>	<u>\$46</u>	<u>\$48</u>	<u>100</u>

DIRECT COSTS

The university's accounting procedures provide that any expenditure which can be identified as benefiting a specific research project be classified as a direct cost of the project and charged in its entirety to the project account. The incurrence of direct costs and their charging to the appropriate research project account requires approval by the researcher responsible for the project. The researcher receives monthly expenditure reports for review to ensure that only proper costs have been charged to the project.

Direct costs include salaries and wages of persons directly engaged in the project, related employee benefit expense, costs of material and supplies consumed, cost of equipment purchased, travel expenses, and any other costs which may be identified directly with the project.

Salaries and wages charged to research projects as direct costs include compensation of faculty members, researchers, students, clerks, secretaries, and service unit employees used directly on research projects. Social security taxes, pension benefit costs, health insurance, vacation accruals, and holiday and sick leave pay of these employees are also included under the salaries and wages category. Further information on types and compensation of employees engaged in research activities is shown beginning on page 48.

Equipment, as classified and recorded by the university, is an item costing in excess of \$100 (recently increased from \$25) with a useful life of over 1 year that is not used as part of an end-item. Regardless of whether the university or the Government obtains title to the equipment when purchased, its cost is charged directly to the applicable research project. Additional information regarding equipment is shown on pages 40 to 47.

Travel consists primarily of field trips necessary to accomplish the objectives of the research project, trips to the sponsoring agency to discuss progress and plans, and trips to scientific conferences in the same field of science as the project. Generally Federal research contracts and grants awarded to the university do not contain specific travel policies or procedures but, instead, specify adherence to the university's travel policies and procedures which provide for reimbursement of actual reasonable expenses. Our review of a limited number of travel vouchers applicable to employees associated with the university's research effort showed that the average daily reimbursement for lodging and meal expenses was about \$20. In accordance with university policy, lodging expenses, car rentals, conference registration fees, and other major travel costs were supported by receipts and reimbursement for air travel was generally limited to less than first-class fares.

Supplies and other direct costs charged to projects include such items as office supplies, telephone and telegraph charges, postage, and technical publications. Supplies and other direct costs include also charges from those units providing centralized services to instructional and research organizations. These services include, for example, technical typing and illustrations, reproduction, computerized data processing, and photography. These service units are self-supporting, and each benefiting organization or project is charged for the use of the services. The charges are based on predetermined usage rates which are adjusted periodically to ensure that neither a profit nor a loss results from the operations of the service units.

INDIRECT COSTS

An indirect cost is an expenditure which benefits more than one research project but cannot be identified with the specific projects or which benefits both the research and instruction activities of the university. Indirect costs include the general and administrative expenses of the university's various departments and other organizations, operation and maintenance expenses related to the physical plant, library expenses, student services expenses, and building and equipment use charges.

To determine the amount of indirect cost that will be applicable to federally financed research, the Government and the university negotiate an annual indirect-cost rate based on prior costs. This rate is expressed as a percent of the amount of salaries and wages charged as direct costs to the research projects.

Categories of indirect costs

For negotiation purposes, the university groups the various indirect costs into nine separate categories or pools. The name of each pool and the relationship of the costs in each pool to the total estimated indirect costs applicable to research for fiscal year 1969 are shown in the table below.

<u>Name of pool</u>	<u>Relationship to total indirect costs applicable to research (percent)</u>
Department administration	27
Research administration	27
General and administrative	12
Plant	11
Libraries	7
Heating plant and utilities	5
Building use charges	5
Equipment use charges	5
Student services	<u>1</u>
Total	<u>100</u>

The general makeup of each of the nine pools is:

- Departmental administration expenses consist primarily of salaries, wages, and associated staff benefits for certain employees in those departments or units in which research is conducted. These employees include the dean of the school or college, the departmental chairman, the department administrative staff, and certain faculty members. Salaries for faculty members are limited to those portions applicable to the performance of administrative functions that jointly benefit research and instruction. Such expenses for the Institute for Social Research and the Institute of Science and Technology are included in the research administration expense pool.
- Research administration expenses are primarily the administrative expenditures for the office of research administration; the above-named two institutes; and the accounting, purchasing, and personnel offices established to support the research activity. The expenditures consist mostly of personnel salaries and wages and associated staff benefits.
- General and administrative expenses include costs of the general executive and administrative offices of the university and other expenses which do not relate solely to any specific division within the university. Also included in this category are the costs of the purchasing department, accounting department, and personnel office.
- Plant expenses include costs of janitorial services; repairs to, and normal alterations of, buildings; and other services associated with the operation, maintenance, preservation, and protection of university property.
- Library expenses are the costs directly associated with the operations of the university's libraries, including book purchases.
- Heating plant and utilities expenses are those incurred in operating the university's heating plant

and for the purchase of utilities, such as fuel, electricity, and water. Also included in this pool are the expenses for the care and maintenance of grounds.

- Building use charges, currently 2 percent of the annual capitalized value of the buildings, are intended as compensation for use of university-owned buildings and for capital improvements over and above the expenses for operation and maintenance. The capitalized value of each building is based upon construction costs exclusive of any Federal funds provided for the construction.
- Equipment use charges are similar to building use charges except that the rate is 6-2/3 percent of the annual capitalized value.
- Student services expenses consist of salaries, wages, and other costs associated with organizational units that administer student affairs, such as the offices of deans of students and the placement office.

Negotiation of indirect-cost rates

The Federal Government and the university negotiate indirect-cost rates annually that will be used as the basis for recovery of indirect costs on each federally financed research contract and grant. The basis for negotiation is contained in BOB Circular No. A-21, which outlines the principles and policy guides for reimbursement of indirect costs to educational institutions. The Government is represented by a negotiating team composed of representatives from the major sponsoring agencies and headed by one of the defense agencies. In the past year, the Air Force's Office of Aerospace Research served as the head agency. In addition, the Defense Contract Audit Agency, which maintains a staff at the university (see p. 108), assisted the agencies in an advisory capacity during the negotiations.

The procedures followed for negotiating indirect-cost rates at the university are summarized below.

1. The university submits an indirect-cost proposal based on costs derived from its most recent operating experience and using the cost principles delineated in BOB Circular No. A-21. The proposed rates express the indirect cost as a percentage of the labor cost charged direct to research projects.
2. The proposal is audited by Federal auditors. An advisory audit report is sent to the Federal agencies financing research at the university.
3. A coordinated negotiation by representatives from the major sponsoring agencies and the university is conducted under the sponsorship of one of the defense agencies.
4. At the completion of negotiations, the head agency prepares a negotiation report setting forth the rates negotiated, the reasons for any variation from the audit report, the period of rate applicability, and the basis for determination of such rates.

Prior to fiscal year 1969, each rate was fixed for a specified time and was not subject to retroactive adjustment. Beginning with fiscal year 1969, the rates were provisional, i.e., subject to retroactive adjustment. The change from fixed to provisional rates was made because the Government and the university could not agree upon the anticipated research volume for 1969 and 1970. The indirect-cost rates for the period July 1, 1964, through June 30, 1970, follow.

Negotiated Indirect Cost Rates

<u>Period</u>	<u>Campus</u>	<u>Health Science</u>	<u>WRL</u>	<u>Type</u>
	————(percent)————			
July 1, 1964, to Dec. 31, 1965	46	-	40	Fixed
Jan. 1, 1966, to June 30, 1967	45	55	43	Do.
July 1, 1967, to " " 1968	45	62	43	Do.
" " 1968, to " " 1969 (note a)	54	55	54	Provisional
July 1, 1969, to " " 1970	54	55	54	Do.

^aThe provisional rates for fiscal year 1969 were originally negotiated on July 5, 1968, at 47%, 60%, and 47%, respectively. To prevent substantial over or under payment, however, the provisional rates were renegotiated on April 4, 1969 as shown. As of November 13, 1969, the fiscal year 1969 provisional rates had not been finalized.

Prior to fiscal year 1961, the university had only one indirect cost rate which was applicable to all its federally financed research projects. In fiscal year 1961 the Government negotiators required the establishment of two rates, because projects at the Willow Run Laboratories were bearing a disproportionate share of certain indirect costs primarily applicable to research performed on the campus. Although we did not review the 1961 rates, we believe that the establishment of separate rates for the two locations was necessitated by exceptionally high building and equipment use charges applicable to the campus area compared with those applicable to WRL because (1) the buildings at WRL were donated to the university by the Government and (2) most of the equipment at WRL was Government-owned.

For calendar year 1966, the Government negotiators recognized that indirect costs in the health science area were higher than such costs for the remaining portion of the campus and consequently required establishment of a separate rate for the health science area. As a result, three indirect-cost rates have now been established at the university in recognition of the various factors affecting the amount of indirect costs related to the areas in which research is being performed.

UNIVERSITY VIEWS ON INDIRECT COSTS

University officials expressed concern about the use of provisional indirect-cost rates which would subsequently require adjustment and about the use of multiple indirect-cost rates at the institution.

Provisional indirect-cost rates

University officials informed us that the administrative effort for grantee institutions and for the Federal agencies in the use of provisional indirect-cost rates far outweighed any advantages of precision offered by postdetermination. They stated that, if for any reason provisional rates were too low, a condition of instant overruns was created and that, in their experience, they have never recovered all of these costs. ~~✗~~ In provisional rates are kept high, the faculty complains and, in fact, funds which otherwise might be used for productive research are immobilized. In either case, they contend, contracts must be amended, grant financial reports must be adjusted, and project closing and final billings are delayed.

A proposal has been made to BOB by the Committee on Government Relations, National Association of College and University Business Offices, whereby rates would be fixed in advance and the difference between estimated costs and final costs (determined later) would be "rolled forward," plus or minus, into the next period. The committee claims that this proposal, or something similar, would save administrative effort for both parties and would make possible much better financial planning and control at the project level.

Conclusion

In principle, the roll-forward concept, when used with predetermined overhead rates, has merit as it would accomplish the same purpose as provisional rates--reimbursement of actual indirect costs. The use of provisional rates impedes the timely close-out of grants and contracts and disrupts preparation of the university budgets for each research project. The use of predetermined rates, in

conjunction with roll-forward features, would have the opposite effect, i.e., administrative simplicity.

As indicated by the Committee on Government Relations, National Association of College and University Business Offices, universities may be willing to forego quicker reimbursement of actual indirect costs in order to achieve administrative simplicity. We believe that the benefits derived from administrative simplicity--for both the Federal agencies and the universities--outweigh the benefits of provisional rates.

Recommendation

We recommend that the Director, Office of Management and Budget, consider the roll-forward concept and pursue this matter further with the various Federal agencies and educational institutions. We also suggest that, during the negotiations for the university's fiscal year 1971 overhead rates, the parties to the negotiations make every effort to arrive at predetermined rates.

Response by agencies

BOB noted that it was considering the use of the roll-forward concept to permit the equitable application of predetermined indirect-cost rates in more cases and had drafted a revision of Circular No. A-21 to incorporate this and other matters. AEC expressed its general opposition to the roll-forward technique on the ground that the variances in research expenditures among agencies from year to year at individual institutions would create inequities in the amounts of indirect costs which the agencies would bear. AEC also asserted that, because the historical delay in the preparation and negotiation of indirect-cost-rate proposals would prolong the adjustment to actual rates 2 to 3 years beyond the period to which they apply, serious problems of administration and further disparities in indirect costs charged to the Federal agencies would be created. All the other agencies endorsed the recommendation directly or by implication.

Regarding the position of AEC, the year-to-year variations in expenditures for each agency and in relation to

each other for the fiscal years 1955 through 1968, as shown on page 8 , have been within what would seem to be a tolerable range of difference that would not create any significant inequity to any of the agencies through application of the roll-forward technique. On this premise and assuming continued variances in expenditures in about the same proportion among the agencies, any time delay in adjusting estimated to actual indirect-cost rates would not seem to be relevant.

Multiple indirect-cost rates

The second of the university's major concerns is the trend toward the use of separate indirect-cost pools, which results in a single institution having several indirect-cost rates. University officials informed us that, from a cost accountant's point of view, there was little to criticize, since the objective of several rates was to provide more accurate costing and since the criteria were significance and substantiality. They contend that, in actual practice, however, the use of multiple rates makes research management more complex and does not really improve the equity between the institution and the Federal Government as a whole.

University officials stated that, at best, the refinement of allowable indirect costs into several pools might improve the equity among the various Government contracting or granting agencies whose grants or contracts might be in different disciplines or have different characteristics. From a purely cost-accounting viewpoint, one can justify separate pools for individual schools, departments, or even individual laboratories. They contend that this concept is fine in industry but that in a university separate rates tend to create artificial barriers between academic units and to impede the free interplay of physical location, exchange of employees, and interdisciplinary operation.

The university officials believe that the averaging concept employed in one rate should be encouraged and extended and that the multiple rates should be avoided for projects which are integrated into the university's academic structure. They further believe that, as long as direct-cost definitions are consistent and the single pool

contains only allowable costs, there can be no overreimbursement in total.

Conclusion

The university's objections to the use of three indirect-cost rates are not related to the equitable distribution of indirect costs. Rather, they are concerned with the creation of artificial barriers between academic units and research employees. The university officials concede that the refinement of indirect costs into the three pools may improve the equity between Federal agencies, which, in essence, is the purpose of such rates.

It is interesting to note that, as shown on page 97, the difference among the various rates has been reduced. We believe that the reduction in differences is due to the changing volume of research among Federal agencies-- primarily HEW and DOD--and the resulting shift in activities at the university, e.g., reduction in DOD support at WRL and increase in HEW support in the health sciences area.

In our opinion, the use of three indirect-cost rates at the university results in a reasonably equitable method of distributing such cost without requiring extensive detailed studies. Further, the equitable distribution among agencies is consistent with the intent of the Congress which appropriates research funds for each agency.

Recovery of indirect costs

7
The university's overall recovery of indirect costs on federally financed research projects for fiscal years 1966, 1967, and 1968 amounted to about 35, 37, and 40 percent, respectively, of salaries and wages charged direct to such projects. During this period, the lowest negotiated rate was 40 percent for the first half of fiscal year 1966. Thus, as indicated by these percentages, the university has not fully recovered its total indirect costs applicable to federally financed research projects. Since the indirect-cost rates applied to projects financed under contracts were identical to the negotiated rates, the less-than-full

recovery of indirect costs evidently occurred under projects financed by grants.

Prior to fiscal year 1966, the Congress limited the amount of indirect costs that could be recovered on research projects financed by grants. The HEW appropriation bill for fiscal year 1958 provided that none of the funds appropriated for HEW be used to pay any grant recipient for the conduct of a research project an amount for indirect costs in excess of 15 percent of the direct costs. For fiscal year 1963, the percentage limitation was increased to 20 percent and the concept of limiting the amount of indirect costs allowed on research grants by legislation was extended to other agencies. The applicable appropriation acts limited DOD to 20 percent and NASA and NSF each to 25 percent. For fiscal year 1964, the limitation was 20 percent for all these agencies.

As the university has many grants that were awarded during the period of limitation on recovery of indirect costs, it has been unable to recover the total indirect costs applicable to such grants. The overall rate of recovery on grants, however, increased from 35 percent in fiscal year 1966 to 40 percent in fiscal year 1968, which indicates that the number of grants containing the limitation had been reduced. As the remaining grants of this nature phase out, the rate of recovery of indirect costs should continue to rise until it equals the negotiated rate.

UNIFORM FORMULA FOR INDIRECT COST OF RESEARCH

In accordance with a request from the House Committee on Appropriations in October 1968, we made a study to assist the legislative and appropriation committees in achieving a realistic and uniform formula for ascertaining indirect costs on research grants on the basis of sound accounting principles. This study was made at 14 educational institutions, including the University of Michigan. As stated in our report entitled "Study of Indirect Cost of Federally Sponsored Research Primarily by Educational Institutions" (B-117219, June 12, 1969), we concluded that a uniform formula, in the sense of a uniform percentage rate

for indirect cost to be applied to direct cost or some element thereof, would not result in a realistic or equitable determination of indirect cost and that there was not enough standardization among research institutions and projects to permit use of a uniform formula or a fixed method of determining indirect cost.

We further concluded, however, that uniform standards and guidelines for the determination of indirect costs were feasible, provided that they had sufficient flexibility to enable their application of different circumstances. In the report, we also pointed out several items for the information of the Congress and for administrative consideration of revisions in the cost principles set forth in BOB Circular No. A-21 or in their administration. BOB has informed us that a revised Circular No. A-21 is in process and that the GAO-suggested revisions are being considered.

CHAPTER 12

AGENCY MONITORING OF RESEARCH PROJECTS

~~The various~~ Federal agencies monitor the technical and financial aspects of each federally financed research project at the university by means of site visits and periodic technical and financial reports. The agencies generally make more frequent site visits and require more frequent technical reports for projects financed by contracts than for projects financed by grants.

SITE VISITS

Technical representatives from virtually every agency visit the university to discuss the technical aspects and progress of research projects their agencies support. Agency representatives, however, seldom make site visits for the purpose of reviewing administrative matters. Generally, the resident representative of the Office of Naval Research and the cognizant audit agency perform this function.

For projects supported by contracts, agency representatives normally make site visits three or four times a year. Several departmental chairmen and researchers advised us that, for projects in which the agencies have an especially high degree of interest, the representatives make site visits as frequently as once a month.

In regard to projects supported by grants, agency representatives make about one visit a year to the large dollar-amount projects and to those small dollar-amount projects in which the agencies have an especially high degree of interest. Site visits to grant-supported projects often coincide with the agencies' reviews of the researchers' request for continuing support of the projects.

In addition to the site visits by agency technical representatives, university researchers visit the agencies to discuss project results to date and plans for subsequent periods. Such visits are made in connection with both contract-supported and grant-supported projects.

TECHNICAL REPORTS

Most agencies require the university to submit some combination of monthly, quarterly, semiannual, annual, and final technical reports on contract-supported research projects and on those grant-supported projects that are closely related to the more immediate needs of the agencies.

The monthly and quarterly technical reports are generally in letter form, relatively informal in nature, and only several pages long. These reports summarize the project activity and progress for the period. Depending upon the requirements of the particular agencies, the reports may also include information on (1) total hours expended by professional and technical employees, (2) fiscal status, (3) problems encountered, and (4) future plans. Summary descriptions of the content of two such reports follow.

--The October 1968 monthly letter report on a NASA contract was four pages long. The first two pages contained general narrative statements on work performed under two tasks and brief preliminary conclusions under one task. The last two pages of the report contained graphs showing the authorized, planned, and actual expenditures of man-months and dollars.

--A report on an AEC contract for the 9-month period ended January 31, 1969, was nine pages long. One page was devoted to those items normally shown on a title page; seven pages briefly described in narrative form the work performed, some of the results obtained, and the direction of future work; and one page listed reference material used in the narrative portion of the report and publications contributed by the researchers during the period as a result of the project.

When appropriate, the quarterly reports are expanded to discuss, in detail, the techniques employed and the technical findings.

Semiannual, annual, and final technical reports serve primarily to apprise the agencies of the results of the research. As such, these reports generally consist of a

comprehensive summary of the work performed, procedures and techniques employed, problems encountered and their solutions, and the results of the research. In addition, they usually set forth areas requiring further research.

Six such reports we reviewed ranged in length from 50 to 170 pages. In general, the format of the reports included a foreword, abstract (brief summary of problem and results), introduction, detailed description of methodology and results, conclusions, and references.

For grant-supported projects involving basic research, the results of which are not expected for several years, the agencies generally require annual and final technical reports. The annual report normally is an integral part of the university's annual proposal requesting continuing support and, as such, serves as both a progress report on technical aspects and a justification for continuing the work. The final report on a grant is comparable in format and scope to the final technical report required for a contract, as described above.

FINANCIAL REPORTS

Each Federal agency supporting research at the university requires the periodic submission of a financial report for each contract or grant. The frequency of such a report differs among agencies and, in some instances, between the types of instrument used to support the research within the same agency. At a minimum, however, an annual report is required. The type of financial data presented in the various reports is fairly comparable.

For projects financed through grants, the Army, Air Force, NSF, and HEW--the more significant grantors--require at least one financial report during the life of each project. If the life of the project is in excess of 1 year, an annual report is required. Each report generally includes the grant number, project and budget period, grant amount, expenditures for the period by category, amount of cost sharing by the university, and budget balance at the end of the period.

Under defense agencies' contracts--which constitute the majority of the Federal research contracts at the university--financial reports are required on a quarterly basis. These reports show quarterly expenditures in total only, rather than by cost categories as required on grants. For contracts, such breakdowns are provided on the monthly payment vouchers submitted by the university. (See p. 86.) In addition, the reports show the estimated costs to complete the projects and forecasts of such costs by quarters.

NASA grants and contracts require the university to submit quarterly financial reports. The type of financial data included is comparable to the data shown in other agencies' reports for grants, as described above.

In addition to variations in frequency, financial reports also differ in format, according to the requirements of the Federal agencies. Standardization of reporting format would encourage mechanization in the preparation of these reports which are now prepared manually. In its comments BOB stated that it was including a standard financial reporting format in a new circular which was in the draft stage.

CHAPTER 13

AUDITING OF RESEARCH ACTIVITIES

The university is audited by several ~~different~~ internal and external audit groups, each of which has different objectives and purposes. Most of the audit activities involve various segments of the university's operations and either directly or indirectly include aspects of the university's research efforts. The major auditing of research activities has been carried out on a continuous basis by the Defense Contract Audit Agency and other Federal agencies have performed some limited audits. The overall activities of the university are audited by its own internal audit staff and by the auditor general of the State of Michigan. The annual financial statements of the university are audited by a firm of certified public accountants.

On July 1, 1969, the HEW Audit Agency assumed all duties and responsibilities of DCAA at the university. Therefore those activities in this report attributed to DCAA are now performed by the HEW Audit Agency.

DEFENSE CONTRACT AUDIT AGENCY

At the time of our study, DCAA had on campus a permanent staff of three auditors having audit cognizance for all DOD, NASA, and AEC contracts. In addition, DCAA reviews the procedures of the various activities of the university which affect the costs charged to federally financed research and, upon request, reviews research contracts and grants for other Federal agencies.

When requested by the agency contracting officer, DCAA reviews the university's contract proposals submitted to DOD, NASA, and AEC to determine the reasonableness of proposed costs. This is done by reviewing actual salaries and wages for persons who will be working on the contract and vendor price catalogs and written quotations for anticipated equipment purchases and by comparing the proposed indirect-cost rates with the previously negotiated predetermined or provisional rates.

The annual indirect-cost rates proposed by the university are also audited by DCAA, and the results are furnished to all Federal agencies sponsoring research at the university. This audit includes an examination into the actual expenditures of prior periods and a review of the reasonableness of estimated expenditures for future periods and the proposed allocation of such expenditures to the research activities. In addition to auditing the proposed indirect-cost rates, DCAA serves in an advisory capacity for the Government in the subsequent negotiation of these rates.

DCAA also examines all payment vouchers submitted by the university under cost-type contracts and, on a monthly basis, provisionally approves each voucher for payment. In fiscal year 1968, expenditures under cost-type research contracts accounted for about \$23 million of the total \$24.3 million of expenditures under all Federal research contracts at the university. DCAA examines the vouchers for each contract primarily to determine whether (1) the correct indirect-cost rate was used, (2) the expenditures were charged to the appropriate contract, (3) the amounts claimed were in accordance with the contract price, and (4) the costs were incurred before the contract termination date. The vouchers are subject to a final audit by DCAA after completion of the contract.

Generally grant proposals submitted to the various Federal agencies by the university are not reviewed by DCAA, and the only completed grants that have been subject to audit by DCAA are those for HEW which specifically requested annual audits of its research and training grants at the university. In fiscal year 1967, costs incurred under HEW research grants accounted for about \$13.9 million of the total \$19.7 million of costs incurred under all Federal research grants at the university. In such audits, DCAA examines into all aspects of individual HEW grants selected through statistical-sampling techniques. For fiscal years 1965-67, DCAA found only minor, isolated errors and deficiencies in university compliance with HEW grant terms. The DCAA auditor in charge informed us that none of the other Federal agencies had ever requested annual audits of their grants.

In addition to reviewing contract proposals and auditing completed contracts and HEW grants, DCAA reviews various management operations that affect the research activities. These reviews encompass specific university operations which are charged, in part or in total, to federally financed research projects. In fiscal year 1968, reviews were made of labor costs, purchasing procedures, fixed assets, travel, interdepartmental transfers, and overhead. At the time of our review in fiscal year 1969, reviews of the university's computer center costs and direct contract costs had been completed. During these reviews DCAA found some minor deficiencies in the university's procedures and internal controls, but did not find any major deficiencies that would adversely affect the management of the research activities or result in unnecessary or unwarranted costs' being charged to the research projects. University officials are receptive to the DCAA reviews and take prompt action to correct deficiencies brought to their attention.

Although auditors from the nondefense Federal agencies occasionally make reviews at the university, these reviews are usually of 1 or 2 days' duration and generally are limited to specific research projects or a group of projects. The DCAA auditor in charge told us that such reviews were infrequent and that the agency auditors generally did not contact the DCAA auditors or inform them of the results.

In May 1968, BOB issued Circular No. A-88, which prescribed the policies for coordinating the establishment of indirect-cost rates and for the audit of Federal grants and contracts with educational institutions. The circular stipulates that one Federal agency be responsible at a single institution for (1) the negotiation of indirect-cost rates and any other special rates and (2) all the necessary auditing of direct and indirect costs of grants and contracts. An interagency committee was established to determine which agencies would be assigned the responsibility at the various educational institutions. The criteria used by the committee in making such assignments included:

- Existing arrangements at institutions.
- Availability of qualified negotiation and audit staff.

--Geographical location of the institution in relation to agency staff.

--Dollar volume, number, and complexity of the grants and contracts of each Federal agency at the institution.

As a result of the interagency committee action, audit cognizance at the University of Michigan was changed, effective July 1, 1969, from DCAA to the HEW Audit Agency. The HEW Audit Agency staff at the university is composed of the former DCAA auditors who were reassigned to HEW at the time of the change in agency audit cognizance. HEW informed us in April 1970 that audit coverage by the HEW Audit Agency would include grants and contracts and other types of Federal financial aid.

INTERNAL AUDIT STAFF

As of December 1968, the university's internal audit staff consisted of one supervisor and six auditors and was under the general supervision of the director of university audits. Internal audit reports are submitted to the head of the unit or department reviewed, the vice president and chief financial officer, and the public accounting firm that annually audits the university's financial statements. A listing of subjects covered by internal audit reports is submitted monthly and annually to the board of regents.

The internal audit program is designed to ensure that, over a period of time, all units of the university will be audited. Most of the audits by the internal audit staff include reviewing, testing, and evaluating the procedures and internal controls of the units being audited. The internal audit staff also reviews various management functions which encompass more than one university organizational unit.

During the period July 1, 1967, through September 30, 1968, a total of 37 audit reports were issued. Of these reports, 11 dealt with special investigations of small misappropriations from various university funds. The remaining reports related to reviews of such subjects as revenues,

accounts receivable procedures, travel expenses, reimbursement procedures, verification of selected inventories, vehicle utilization studies, verification of imprest cash funds, and controls over investments and gifts. The internal audit staff also made a limited review of the university's procedures for preparing research proposals and approving research grants and contracts. In general, the internal audit reports disclosed only minor procedural discrepancies.

STATE OF MICHIGAN, OFFICE OF THE AUDITOR GENERAL

The office of the auditor general audits the university activities to provide management and the Michigan Legislature with objective analyses, appraisals, and recommendations concerning State agencies and programs. In September 1968, the office issued a report on its audit for the period July 1965 through June 1966.

We examined into the following general areas which directly or indirectly relate to the university's research activities.

General fund	Purchasing
Expendable restricted fund	Internal audit
Endowment fund	Distribution of utility charges
Revenue and receivables	Bank reconciliations
Vendor payments	Procedures manuals
Internal controls	Timekeeping and payroll

Although the auditor general's report disclosed several minor deficiencies in many or the above areas, none appeared to have had a significant effect on federally financed research projects. In many instances, the discrepancies apparently resulted from a lack of written procedures in various management areas. Subsequent to the auditor general's report, the university prepared written procedures for some of its major management functions.

PUBLIC ACCOUNTING FIRM

A firm of certified public accountants annually examines the financial statements of the university. In addition, the accountants submit to the university comments and recommendations on selected accounting procedures and systems of internal control that they believe require improvement. Their report for the year ended June 30, 1968, included comments on the following areas that relate to research activities: general accounting matters, inventory controls, data processing, and hospital activities. In the report, the accountants commented on a lack of periodic physical inventories of equipment (see p. 46 for details) and various minor deficiencies. At the time of our review, the university had taken corrective action on the minor deficiencies or had the matters under study.

CHAPTER 14

SCOPE OF STUDY

Our study at the University of Michigan was made at the Main and North campuses in Ann Arbor and at the Willow Run Laboratories.

We reviewed the university's organizational structure to determine how research activities were controlled and coordinated among the various schools, colleges, and departments. We inquired into the types of research performed, the manner in which research projects were conceived and sponsors obtained, and the benefits that resulted from university research activities. We determined the type, number, and compensation of university research employees and inquired into the extent of building and equipment facilities used in research activities. We made a limited evaluation of the university's procedures for purchasing and controlling equipment and of its controls over Government-owned equipment.

We examined into the differences between research projects supported by grants and contracts, reviewed the various methods of funding used by the agencies, and inquired into the extent to which the university shared the cost of research projects. We reviewed also the financial management system established by the university to account for funds received and expended. In addition, we inquired into the nature and extent of the monitoring of research projects by the various agencies, including their requirements for reporting financial and technical data.

We reviewed also, to a limited extent, the scope and results of audits and reviews made by the university's internal audit staff, a firm of certified public accountants, and the State of Michigan auditor general's office. We reviewed in greater detail the scope and results of audits made by the Defense Contract Audit Agency, which, prior to July 1, 1969, was the Government audit group responsible for auditing Federal research grants and contracts at the university. To the extent appropriate, we used the reports of these audit groups in making our review.

In addition to our review at the university, we visited the headquarters, in Washington, D.C., of the Department of Health, Education, and Welfare, the National Science Foundation, the National Aeronautics and Space Administration, the Atomic Energy Commission, the Department of Defense, and the Bureau of the Budget. We discussed with agency officials their policies and procedures relating to cost sharing, their methods of funding, and their controls over equipment purchases.

We considered in our review the reports of several congressional committees and Federal agencies concerning research activities, including our report to the Congress entitled "Study of Indirect Cost of Federally Sponsored Research Primarily by Educational Institutions" (B-117219, June 12, 1969).

APPENDIXES



DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
WASHINGTON, D C 20201

OFFICE OF THE SECRETARY

APR 2 1970

Mr. Philip Charam
Associate Director
United States General Accounting Office
Washington, D.C. 20548

Dear Mr. Charam:

The Secretary has asked that I reply to your draft report to the Congress of the United States on the "Management of Federally Financed Research by the University of Michigan." We are substantially in agreement with its recommendations. However, we do not fully concur with the General Accounting Office view, expressed on page 4 of the report, that cost principles as they relate to interest cost should not be altered.

We have been giving much thought to the propriety of amending Circular A-21 to make interest expense an allowable cost and have participated with the Bureau of the Budget and other Federal agencies in debating the arguments for and against a proposed amendment by the National Association of College and University Business Offices which would make such costs allowable. We have concluded that the outright prohibition now contained in Circular A-21 is not in the best interests of the government. We believe that interest expense as generally defined in accounting terminology, is a real and necessary cost of doing business and with adequate restrictions to prevent abuse, should be recognized as a legitimate charge against Federal grants and contracts. On the other hand, we believe that "interest" in the sense of a loss of potential income arising from the use of money in the conduct of an activity which results in a lower return to the investor than might be had if funds were invested or used for some other purpose, should not be recognized either as cost sharing or as an allowable cost.

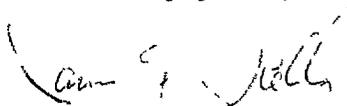
Page 3 of the report states that the time lag between the payment by the University of project costs incurred under cost reimbursement contracts and the reimbursement of these costs by the Federal agencies necessitates the use of the University's own funds in the order of \$3.6 million monthly. This problem is common to all universities involved with Federal cost reimbursement contracts. We believe that advanced funding through either the letter of credit or other similar

Page 2 - Mr. Philip Charam

mechanisms would do much to alleviate this problem without jeopardizing the government's position and without the need for the universities to borrow and thus incur interest expense. We are presently working with the University of Michigan to streamline our letter of credit procedures and are confident that an arrangement can be made which will serve the interest of both the University and this Department.

Lastly, the report states on page 82 that "Contracts are subject to continuous audit by the Defense Contract Audit Agency, while grants are audited only upon request by the sponsoring agency." This statement is essentially correct in relation to audits performed in the past but is not an accurate description of current audit practice. Under BOB Circular A-88 the audit coverage of the cognizant Federal Agency (DHEW, effective 7/1/70) will provide for the examination of not only grants and contracts but also other types of Federal financial aid.

Sincerely yours,



James F. Kelly
Assistant Secretary, Comptroller

EXECUTIVE OFFICE OF THE PRESIDENT

BUREAU OF THE BUDGET
WASHINGTON, D C 20503

APR 8 1970

Mr. A. T. Samuelson
Director, Civil Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Samuelson:

Thank you for your letter of February 12, 1970, providing the Bureau an opportunity to comment on the draft report on the management of federally financed research by the University of Michigan.

The draft report provides considerable useful information on the magnitude of Federal research support, the impact of such support on the University, and the difficulties created by inconsistent administrative policies and practices by the Federal agencies. This information will be helpful to the Bureau of the Budget and the agencies in our current and future efforts to improve the management of Federal research projects.

In regard to the recommendations of the draft report, we have the following comments:

1. Recommendation (Page 97b): "That Congress give prompt attention to the enactment of legislation which will authorize a single policy for cost sharing in federally financed research for all Federal agencies."

Comment: We agree that it would be desirable to establish a single policy for cost sharing on research agreements which would be applicable to all Federal agencies. The Bureau of the Budget is now in the process of preparing a revision of Circular A-74, with the objective of establishing consistent and equitable cost sharing policies and practices among all Federal agencies. Based on our initial efforts, we believe that it will be feasible to attain this objective and provide a policy which is to a large extent consistent with the intent of Section 408 of Public Law 91-126. Such a revised Circular A-74 would obviate the need for additional cost sharing legislation except to remove the current inconsistent statutory requirements. We believe that cost sharing policies can best be established administratively, rather than through legislation. The past history of efforts to establish a cost sharing policy on a Government-wide basis through legislation indicates the difficulty of such an approach, largely because of the varying program needs of the Federal agencies.

2. Recommendation (Page 109): "We suggest that the Bureau of the Budget, Department of Treasury, and other agencies conduct a joint study of the feasibility of adopting a uniform system of providing universities with sufficient advance funds for programs financed by all agencies."

Comment: We concur in this recommendation. A similar recommendation was included in the "Report on the Project Concerning the Policies, Procedures, Terms and Conditions Used for Research Projects at Educational Institutions" issued by the Bureau of the Budget on June 20, 1969. We are now in the process of implementing the recommendations of that report, and specific attention will be given to the matter of the policies and procedures for providing advance funds. Also, this matter will be considered in the interagency study to standardize administrative requirements of grant-in-aid programs under the President's Federal Assistance Review program.

3. Recommendation (Page 120b): "We recommend that the Bureau of the Budget give serious consideration to the 'rolled forward' concept [of establishing predetermined overhead rates] and pursue this matter further with the various Federal agencies and educational institutions."

Comment: In connection with other proposed revisions to Circular A-21 now under consideration, the Bureau and the Federal agencies are considering the desirability and feasibility of using the "rolled forward" concept to permit the equitable use of predetermined indirect cost rates in more cases. We have also received comments from the GAO regarding this provision, and those comments will be considered in developing a revised Circular A-21.

We have the following additional comments on the draft report:

1. On page 123, the report refers to GAO Report B-117219 which suggested revisions in the cost principles in BOB Circular A-21. The proposed revisions of A-21 now under consideration reflect those suggested revisions. GAO's comments have also been received on these proposed revisions and will be fully considered in developing a revised A-21.

2. On page 128, the report suggests the desirability of standardizing the financial reporting requirements under research agreements. This was also a recommendation of the Bureau's June 20, 1969, report on university research agreements, and a standard financial reporting

format is being established in connection with the implementation of the recommendations of that report. This matter will also be considered in the interagency study to standardize administration of grant-in-aid programs.

Sincerely,

A handwritten signature in black ink that reads "Robert F. Mayo". The signature is written in a cursive style with a large, stylized "R" and "M".

Robert F. Mayo
Director

APPENDIX III



DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
WASHINGTON D C 20301

14 APR 1970

Honorable Charles M. Bailey
Director, Defense Division
United States General Accounting Office
Washington, D. C. 20548

Dear Mr. Bailey:

This office has reviewed and evaluated the GAO Draft report "Management of Federally financed research by the University of Michigan." The purpose of this letter is to forward our comments as the OSD position concerning the content of the report.

We would commend the staff responsible for the preparation of the report. The comprehensive and detailed information concerning the organization, management, funding, and accounting of university research activities is presented in an excellent, well-ordered manner. We endorse the issuance of the report and concur that the recommendations therein will contribute to more efficient procedures and a better understanding of Government-wide policies regarding university-managed research performed in the national interest.

Special note was taken of the matters relating to cost sharing and indirect costs. The conclusions and recommendations concerning these issues are in agreement with the separate report "Study of Indirect Cost of Federally Sponsored Research Primarily by Educational Institutions" (B-117219, 12 June 69). The DoD position on that report is a matter of record.

Sincerely,


for John S. Foster, Jr.



UNITED STATES
 ATOMIC ENERGY COMMISSION
 WASHINGTON D C 20545

April 15, 1970

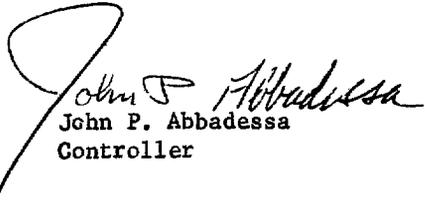
Mr. Lloyd G. Smith
 Associate Director
 Civil Division
 U. S. General Accounting Office

Dear Mr. Smith:

Concerned staff members of the Atomic Energy Commission have reviewed your draft report titled "Management of Federally Financed Research by the University of Michigan." With the exception of a minor statement which Mr. George Staples, Associate Director, agreed to change, the report's presentation of matters concerned directly with AEC contracts with the University of Michigan are factually correct.

This report comments on a number of problems relating to research performed by educational institutions for the Federal Government which were the subject of previous reviews by the General Accounting Office and the Bureau of the Budget. AEC's views on these matters (distinction between grants and contracts, requirements for cost sharing on the part of the universities, allowability of interest and predetermined fixed indirect cost rates with provision for "rolling forward" differences between actual and estimated costs, etc.) were provided previously to the GAO and the BOB. Since there is no indication that GAO intends to present in this report the views of other Government agencies regarding these matters, we will not comment on them again. However, we are attaching to this letter * copies of correspondence with GAO and BOB in which AEC's views are presented.

Sincerely,


 John P. Abbadessa
 Controller

Enclosures

1. Ltr Seaborg, AEC, to Staats, GAO, dtd 1/24/69, w/encl.
2. Ltr Abbadessa, AEC, to Ink, BOB, dtd 4/9/70, w/encl.

*The material in the attachments deals in some detail with certain matters related to the indirect cost study (see p. 76) and the revision of BOB Circular A-21 (see p. 103). Those matters which are pertinent to the purpose of this report have been summarized in the related sections of this report in lieu of including the attachments.

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D C 20550

April 16, 1970

Mr. Philip Charam
Associate Director, Civil Division
General Accounting Office
Washington, D.C. 20548

Dear Mr. Charam:

Thank you for the opportunity to review and submit comments on your proposed report to the Congress on the "Management of Federally Financed Research by the University of Michigan (A Case Study)."

I am pleased to inform you that it is the consensus of the key staff members who reviewed the draft that it is a good report because it will contribute to more orderly government-university relationships. It is informative at a general level and will provide the Congress and the Public with a clearer picture of the management of federally financed research and related problems at the University of Michigan. In this regard it would be helpful if a special paragraph were included in the Overview section of the report which called attention to the fact that each college and university in the United States has differing management practices, and that the reader should not assume that the University of Michigan system of managing federally funded research is the pacesetter for all these institutions.

The recommendations are timely and of major interest to many colleges and universities as well as the governmental agencies. However, in Chapter 12, the Financial Reports Section is not developed in depth. It is common knowledge to federal program officers that the colleges and universities are not happy about the multiplicity of financial reporting requirements prescribed by the federal agencies. Standardization and simplification of financial reporting would contribute to greater efficiency and could lead to reductions of indirect costs. We feel that this important area is worthy of a feasibility study by the Bureau of the Budget, Department of the Treasury, General Accounting Office and relevant agencies. The limitation on expenditures prescribed by the federal agencies was not covered in the report, and it would have been interesting to have learned about the consequences.

Your staff is to be complimented for preparing a meaningful and very enlightening report.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Bernard Sisco". The signature is written in a cursive style with a large initial "B".

Bernard Sisco
Assistant Director
for Administration



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D C 20546

APR 21 1970

REPLY TO
ATTN OF Y

Mr. Lloyd G. Smith
Associate Director, Civil Division
U. S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Smith:

We have reviewed the GAO draft report "Management of Federally Financed Research by the University of Michigan" and believe it provides valuable insight into university management of Federally-sponsored research programs.

NASA does not oppose the four recommendations contained in your draft report. However, we continue to have reservations with regard to mandatory cost sharing on federally sponsored research at universities because it might reduce our flexibility to support research which is mission oriented.

In recognition of the different amount of cost sharing that should be required for basic research as compared to the amount required for applied research supporting the mission agencies such as NASA, a single cost sharing policy should retain the flexibility now provided in Section 408 of the NASA FY 1970 Appropriation Act which states that "the extent of cost sharing by the recipient shall reflect the mutuality of interest of the grantee or contractor and the Government in the research."

Sincerely yours,

A handwritten signature in cursive script that reads "Bernard Moritz".

Bernard Moritz
Acting Associate Administrator for
Organization and Management